Hughes
Mundon

CHAMBERS'S

ENCYCLOPÆDIA:

A DICTIONARY

OF

UNIVERSAL KNOWLEDGE FOR THE PEOPLE.

ILLUSTRATED.

AMERICAN REVISED EDITION.

IN TEN VOLUMES.

VOL. IX.

PHILADELPHIA:
J. B. LIPPINCOTT COMPANY.

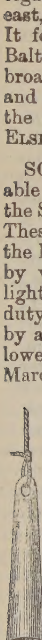
CHAMBERS'S ENCYCLOPEDIA

A DICTIONARY OF

UNIVERSAL KNOWLEDGE FOR THE PEOPLE.

SOUND (Ger. *Sund*, according to Grimm, for *Suumd*, from the root of *Swim*), **a word signifying generally a strait or narrow sea-way; but applied specially to the strait which leads from the Cattegat into the Baltic Sea, between Sweden on the east, and the Danish island of Seeland on the west. It forms the usual passage from the north to the Baltic Sea, is 40 miles long, and nearly 3 miles broad at its narrowest part, between Helsingborg and Elsinore (q. v.). Its entrance is defended by the strong castle and fortress of Kronborg. See** ELSINORE.

SOUND DUTIES, certain dues formerly payable to the Danish government by all vessels passing the Sound or strait separating Sweden from Seeland. These duties originated in an agreement between the king of Denmark and the Hanse Towns in 1348, by which the former undertook to maintain the light-houses in the Cattegat, and the latter to pay duty for them. England became bound to pay duty by a treaty of date 1450, and other countries followed. The Sound Duties were abolished on 14th March, 1857, by a treaty between Denmark and other powers. A pecuniary compensation of £3,-386,528 was stipulated to be paid to Denmark, which was to be held bound to maintain the light-houses and superintend the pilotage of the Sound. By a separate treaty the United States paid to Denmark £79,759.



Sounding Lead.

SOUNDING is the act of ascertaining the depth of water beneath a ship or boat. It is a necessary operation when navigating a sea in which shoals or sunken rocks exist, or when approaching a shore. With the help of charts of soundings, it also assists the captain in fixing the precise point at which his ship is. The process of sounding is performed by a man, standing in the ship's chains, throwing the Lead (q. v.). In tolerably shallow water, he sounds with the hand-lead line of from 20 to 30 fathoms long, which is marked at distances of 2 or 3 fathoms by pieces of cloth or rag of different colours. When he feels the lead touch the bottom, he observes the mark next above the surface, and from it estimates the depth. Thus, if the mark 5 be close to the surface, he calls out: 'By the mark, five,' If the water come between two marks, he calculates in his mind the fraction of the interval immersed, and shouts: 'By the dip, four,' or 'By the dip, four and a half five,' which last means 4½. The hand-lead is thrown a little forward as the ship proceeds. The deep-sea line is marked every 10 fathoms, with an intermediate knot at every 5 fathoms, and may be of any length. In casting it, to obtain as vertical a measurement as possible, the ship is ordinarily hove to, and the lead cast as far as practicable in the line of her drift.

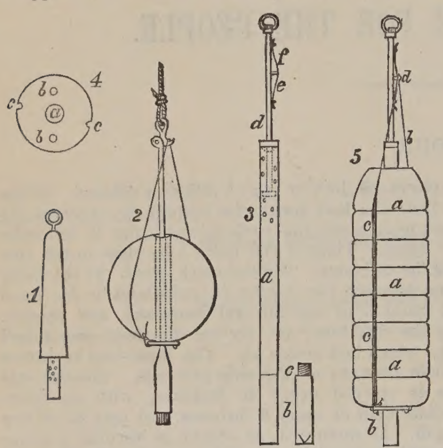
SOUNDING, DEEP SEA. Until within a few years past the term *deep sounding* was understood to be that in which a ship sounded to ascertain her position, and where the depth exceeded that which could be obtained with the lead thrown by the hand, or hand-lead; but the necessities of telegraphic communication across the ocean by means of cables containing insulated wires have caused the ocean to be measured at depths which were never before considered necessary, or even practicable.

The act of obtaining a deep-sea sounding may be said to consist of two parts: 1. To get the sinkers to the bottom as quickly as possible with the line straight up and down; and 2. To bring a portion of the soil of the bottom, as a proof, to the surface; this necessitates the use of a small but strong line, with heavy sinkers and a detaching apparatus for freeing the sinkers when they reach the bottom, as from the smallness of the line and the great friction of all passing through the water the strain of bringing the sinkers up would be too great for its strength. It may be stated that there is no difficulty whatever in obtaining a sounding and regaining the sinker with bottom specimens up to a depth of 1000 to 1200 fathoms (1½ miles) by means of a heavy lead fitted with a valved tube (fig. 1); but when the depth exceeds 2000 fath

oms, the difficulties in obtaining a correct sounding increase in a compound ratio with the depth.

The first detaching apparatus (fig. 2) was devised by Mr. Brooke, a midshipman of the United States navy. It is extremely simple and efficient. It consists of a rod with a movable hook at the upper end and a tube at the lower end. The sinker is a perforated shot through which the tube passes, and by means of a ring below the shot the weight is suspended to the hook by wire, the hook being kept up by the sounding-line; the tube is filled with cut quills. When the weight touches the ground, the line is slackened, the hook falls, and the suspending wire being freed the shot slides off; while the quills, being thrust into the soil, secure a small portion, which is brought up with the rod.

Many different kinds of detaching apparatus have been invented since, but that now used on board H.M.S. *Challenger*, in her deep-sea exploration voyage, is but a modification of the original Brooke's machine. The Hydra machine (fig. 3) consists of a tube of iron, 2½ inches in diameter, and 4½ feet in length, *a;* the lower 12 inches, *b*, is separate from but screws to the upper part at *c;* it is fitted with a butterfly valve at the lower end, to retain the bottom specimens. At the upper end of the tube is a piston-rod, *d*, which



moves freely in the tube. To the upper part of this rod is fixed a steel spring, bent in a bow, *e;* a slit in the spring is adapted to the hook, *f*, which protrudes beyond the spring when the latter is forced back. The sinkers (fig. 4) are cast-iron disks of half a cwt. each, the hole through the centre, *a*, being sufficiently large for the sounding-tube to pass through. They are made to fit each other by means of small conical protuberances on the one side and corresponding hollows on the other, *b;* so that when placed one on another, the groove, *c*, in the one weight corresponds to that on the other. The upper and lower sinkers differ a little in form.

When a sounding is to be taken, the machine is prepared as in fig. 5, a wooden stand being used for the purpose. The sinkers, *a*, *a*, are piled to the required weight, say 4 cwts.; the tube is then passed through them, and an iron ring (with a bight of iron wire attached), *b b*, is passed on the lower end of the tube and the wire led along the continuous grooves on each side of the sinkers, *c*, and the bight passed over the hook, *d*, the spring being pressed back. When the weight of the sinkers rests on the ring, and is supported by the wire, the weight keeps the spring pressed in, but as soon as the sinkers touch the ground, and the weight is relieved from the wire, the spring throws it off the hook, and the tube is drawn clear through the sinkers.

When the tube with sinkers complete is ready, it is carefully hoisted over the side, lowered gently into the sea, and eased down 100 or 200 fathoms before being let go. It is then let go, and the passing of each 100-fathoms mark is timed and recorded in a printed form made to contain all the particulars of the sounding. Sir William Thomson, F.R.S., has invented a mode of deep-sea sounding by using piano wire instead of hempen lines, which promises to obviate much of the present difficulty in deep-sea sounding.

Many very deep soundings are on record, but it is believed that the deepest well-authenticated one was obtained by Captain Nares, of H. M. S. *Challenger*, when about 80 miles to the northward of the Virgin Islands, the depth being 3875 fathoms, or nearly 4½ miles. Unfortunately, not thinking that so near the islands so great a depth would be found, only 3 cwts. of sinkers were used (the usual quantity for such extreme depths being 4 cwts.); this weight with a one-inch line took an hour and twelve minutes to reach the bottom. As the ascertainment of the sinkers reaching the bottom depends upon the time intervals, it may be stated that the line let free to run with this weight would take about 43 seconds running out the first 100 fathoms, and the time increases as nearly as possible three seconds for each successive 100 fathoms; so that when the interval is prolonged beyond this rate the sinker has reached the bottom, and it is merely the weight of the line in the water that causes the line to run out from on board the ship. On this occasion the last 50 fathoms ran out at the rate of 2 minutes 36 seconds per 100 fathoms.

An idea of the average depth of the North Atlantic Ocean may be had from the fact that of 108 soundings obtained by the *Challenger* 48 were between 1000 and 2000 fathoms, 56 between 2000 and 3000, whilst only the other 4 exceeded 3000.

SOUP (A.-S. *sup-an*, to sip or sup) is a well-known form of food, obtained either from flesh and vegetables, or from vegetables alone. When finely chopped muscular flesh (or butchers' meat) is lixiviated with cold water, and exposed to pressure, there is left a white fibrous residue consisting of muscular fibres, of connective or areolar tissue, and of vessels and nerves. This lixiviated flesh communicates no flavour to water in which it is boiled, cannot be masticated, and as Liebig observes, 'even dogs reject it.' The cold water dissolves from 16 to 24 per cent. of the dry chopped flesh. This watery infusion contains all the savory and much of the nutrient matter of the flesh, and is usually of a reddish tint from the presence of a little of the colouring matter of the blood. On gradually heating it to the boiling-point, it is observed that the albumen of the flesh (varying in amount from 2 to 14 per cent., according as the animal was old or young) separates in nearly colourless flakes when the temperature has risen to 133°, while the colouring-matter of the blood does not coagulate till the temperature rises to 158°. The liquid is now clear, and of a pale yellowish tint; and as it reddens litmus-paper, it must contain a free acid. The infusion of flesh thus prepared has the aromatic taste and all the properties of a soup made by boiling the flesh. When evaporated, it becomes dark-coloured, and finally brown; and on ceasing to lose weight, there is obtained a brown, somewhat soft mass of 'Extract of Flesh,' or 'Portable Soup,' amounting to about 12 per cent. of the weight of the original flesh, supposed to be dried. 'This extract,' says Liebig, 'is easily soluble in cold water, and when dissolved in about 32 parts of hot water, with the addition of some salt, gives to this water the taste and all the peculiar properties of an excellent soup.' The soup thus made of the flesh of different animals (as, for example, the ox and the fowl) possesses, along with the general flavour common to all soups, a peculiar taste, which distinctly recalls the smell or taste

of the roasted flesh of the animal employed. In order to obtain the strongest and best-flavoured soup, chopped flesh should be slowly heated to boiling with an equal weight of water; the boiling should only be continued for a few minutes (for prolonged boiling only gives rise to the formation of gelatin), and the soup should be then strained off from the solid residue. If, as a matter of economy, it is desirable that the meat should be left in an eatable state (which is not the case with soup made according to the preceding directions), the joint or mass of flesh should be set on the fire with cold water, which should be gently heated to boiling; the flesh thus undergoes a loss of soluble and savoury matter, while the soup becomes richer in them. The thinner the piece of flesh is, the greater is the loss which it experiences. Soup is the medicine of the convalescent, and as a means of restoring the exhausted strength, it cannot be replaced by any article of the Pharmacopœia. Its vivifying and restoring action on the appetite, on the digestive organs, the colour, and the general appearance of the sick, is most striking.

After the preceding observations on the chemistry and medicinal value of soup in the most simple form, we may proceed to notice it very briefly in its ordinary culinary relations. Most soups contain an admixture of meat and vegetables in their preparation; but many good soups can be made either entirely without the use of flesh, or with fish in place of flesh. In the former class may be placed pea-soup (which is, however, much improved if a piece of bacon enters into its composition), green-pea soup, carrot-soup, potato-soup, asparagus-soup; while for fish-soup, pike, tench, and eels are specially used. The basis of all good soups, excepting those in the preceding category, is *stock*, or broth made from all sorts of meat, bones, remains of poultry or game, &c., put together, and stewed in the *stock-pot.*

To make Liebig's *Soup for Children:* Take 1 oz. (one large table-spoonful) of seconds flour, and mix it very slowly and carefully with 10 oz. of cold skimmed milk, until the whole is smooth; add 7½ grains of bicarbonate of potash, dissolved in a tea-spoonful of water (if 60 grains of the potash be dissolved in 1 oz. of water, 1 teaspoonful must be used at a time), and then heat it gently to the boiling-point, and keep it boiling for five minutes. Stir it well while it is being heated; add to the whole fluid 1 oz. (1 large dessert-spoonful) of malt flour (malt ground in a coffee-mill and sieved), mixed with 2 oz. of water, and stir it well. Cover the pan, and let it stand for half an hour in water which is nearly boiling, so as to keep the fluid warm; then strain through a fine sieve, and bottle it. This quantity is sufficient for a day's supply for a child under two years of age, and a quart of milk should be added to it.

SOUTANE (Ital. *sottana*, Fr. *soutane*, Lat. *talaris*, i. e., *vestis*, 'a garment reaching to the ankles'), the name usually given in France and Italy to the outer garment worn in civil life (commonly with a flowing over-dress or robe) by Roman Catholic ecclesiastics, when the strict law of clerical costume is in force; and also ordered to be worn under the priestly robes used in the public ministerial offices of the clergyman. In England, it was called cassock. It is not peculiar to bishops, priests, or even to clerics in holy orders, but may be worn by all who have received even the TONSURE (q. v.). Indeed, the Council of Trent (*Dic. de Reform*, sess. 23, c. vi.) declares that no cleric shall be held entitled to the 'privilege of clerics,' unless he shall wear the soutane. The colour for the secular clergy is commonly black; but dignitaries wear other colours. Thus, the pope wears a white—cardinals, a red—bishops, a violet—many canons, a blue soutane. Its use as obligatory was very general in former times, but it is much less universal than it was thirty years since. It is strictly required to be worn under the sacred vestments by a priest administering the sacraments, or otherwise officiating publicly.

SOUR-SOP (*Anona muricata*), a West Indian fruit tree, of the same genus with the Custard Apple (q. v.). The tree does not attain a large size, but

Sour-sop (*Anona muricata.*)

is much branched and very ornamental. The fruit is very large, often weighing two or three pounds; its pulp is white, succulent, sweet, with an agreeable acidity. The sour-sop is a pleasant and refreshing fruit, and is very much used in the West Indies, being produced in great abundance.

SOUTH, ROBERT, D.D., the son of a London merchant, was born at Hackney in 1633. His earlier education he received at Westminster School, of which Dr Busby was then master; and in 1651, he became a student at Christchurch, Oxford. In 1655 and 1657 successively, he took his degrees of Bachelor and Master of Arts; he was ordained in 1658; and in 1660, he was appointed University Orator. In this function he was fortunate enough to please the Lord Chancellor Clarendon on his installation as Chancellor of Oxford, and in reward of his complimentary periods, S. was made his domestic chaplain. In 1663, he took his degree as Doctor of Divinity; the same year saw him promoted to a prebendary stall at Westminster; and in 1670, he became a canon of Christchurch, Oxford. In 1677, Laurence Hyde, son of the Chancellor, being sent to Poland as ambassador, he was accompanied thither by S., who had been his tutor, and was the object of his warm regard. Shortly after his return, the rectory of Islip, in Oxfordshire, was conferred upon him, and he was made chaplain-in-ordinary to Charles II. He might readily now have become a bishop, but through this and the succeeding reign, he steadily continued to decline the offers of higher preferment pressed upon him. The designs of James II., tending to a Roman Catholic revival, he regarded with deep disapproval and alarm; but so strong was his sense of the duty of submission to the reigning monarch, that he declined all share in the conspiracy to oust him in favour of the Prince and Princess of Orange. When, however, the Revolution was accomplished, he gave in his adhesion to it. But, to his honour, he refused to profit in the way of preferment, by the deprivation of such of the higher dignitaries of the church as could not conscientiously go along with him in recognition of the new order of things. A stanch

and even bigoted adherent of the Church of England, he continued to wage unsparing war from the pulpit, and with his pen, against Puritanism and every other form of dissent, occasionally occupying himself with discussions more strictly theological, till in July 1716, death came to conclude his controversies. He is now chiefly remembered by his sermons: they are masterpieces of vigorous sense and sound English, and abound in lively and witty turns, not always in severely decorous consonance with the seriousness of the subject-matter. As a man, S. seems to have been of sound and estimable character; of pure life, and unblemished honesty and integrity. His entire works were sent from the Clarendon press in 7 vols. (1823), 5 vols. (1843). An edition in 2 vols. appeared at London in 1850.

SOUTHA'MPTON, a municipal and parliamentary borough, important seaport, and county of itself, in the south of Hampshire, 78 miles south-west of London by the London and South-western Railway. It occupies a peninsula at the head of Southampton Water, and between the estuary of the Test or Anton on the west and south, and the mouth of the Itchen on the east. The High Street, which is the principal thoroughfare, extends from the Bargate on the north to the shore on the south border of the town. Crossing the High Street at right angles, are many important streets, and handsome lines of new houses are found in the northern and western suburbs. S. is furnished with the usual municipal and other institutions common to all thriving towns. St Michael's Church, the oldest in the town, contains Norman tower arches, and several of the private houses are of Norman architecture. The *Domus Dei*, or God's House, dates from the end of the 12th c., and is one of the earliest hospitals in England. There are large and commodious docks, covering an area of 208 acres, and capable of floating the largest steamers, at the south-east of the town. S. is the place of departure and arrival for the steam-packets of about ten separate companies. The West India, Mediterranean, East Indian, and China mails have their station here, S. is also an important government emigration port. Its harbour is perhaps the most motley and picturesque in England, being frequently crowded with Lascars, Creoles, Arabs, &c., and on the arrival of mail-steamers, with Indian and American planters, East Indian nabobs, foreign dignitaries, naval officers, and other British and foreign officials in every variety of costume. In 1872, 1393 vessels, of 616,881 tons, entered, and 1233 vessels, of 534,138 tons, cleared the port. Ship-building and engine-making are actively carried on, and there is an extensive general trade. S. is also a fashionable resort in summer. It returns two members to the House of Commons. Pop. (1861) 46,960; (1881) 60,235.

S. supplanted the ancient Clausentum, which stood about one mile to the north-east, and its foundation is ascribed to the Anglo-Saxons. It is called Hamtune and Suth-Hamtun in the Saxon Chronicle. After the Conquest, S., from which there was ready transit to Normandy, began to prosper rapidly, and in early times it traded with Venice and Bayonne, Bordeaux and Rochelle, Cordova and Tunis. A great part of it was burned by the combined French, Spanish, and Genoese fleets in 1338, and in the following year its defences were strengthened. S. is the birthplace of Isaac Watts (to whom a monument has been erected in the West Park), and of a bard of quite a different sort—Thomas Dibdin.

SOUTHAMPTON WATER, a fine inlet, stretching north-west from the point at which the Solent and Spithead unite. It is eleven miles long, and about two miles wide. The Isle of Wight, which intervenes between the S. W. and the Channel, forms a magnificent natural breakwater. The chief rivers which fall into this inlet are the Test or Anton, the Itchen, and the Hamble.

SOUTH AUSTRALIA. Recent legislation has rendered this name a misnomer, by extending the boundaries of the colony so as to include the entire centre of the Australian continent comprised between the Southern and the Indian Oceans, and between the 129th and the 138th—141st degrees of E. long,—an area of over 900,000 sq. miles.

Character of the Soil, &c.—The northern portion of this vast territory enjoys an abundant rainfall, and is watered by numerous streams and rivers, some of them, as the Victoria and the Adelaide, navigable for a considerable distance by ships of burden. The soil is fertile, and suitable for the cultivation of tropical productions of every description. An expedition has recently been despatched to form a settlement in this region; and if Coolie labour can be obtained on reasonable terms, promises to be successful.

The great central region opened up by the explorations of Stuart and M'Kinlay, and the country to the north of lat. 33°, may be described as suited only for pastoral purposes, on account of the irregularity of the rainfall and the scarcity of permanent water; and with the exception of a few patches along the coast, the same description will apply to the country to the westward of Gulf St Vincent, in 138° E. long. The south-eastern division of the colony, comprised between lat. 33° and the Southern Ocean, and between Gulf St Vincent and the eastern boundary of the colony, includes every variety of soil, ranging from absolute sterility to the highest degree of fertility, great portion of it being probably unsurpassed by any region in its adaptability both in soil and climate for the growth of wheat, the vine, and the olive. This region is moderately timbered, the principal varieties being the gum, the stringy bark, and the pine, all extremely useful for fencing and building purposes.

Climate.—A country extending over 27° of latitude must necessarily embrace great varieties of temperature; but the climate, owing to prevailing aridity, appears to be, upon the whole, healthy, and remarkably free from epidemic diseases. The mortality, on the average of three years ending 1863, was but 16·4 in 1000, that of England being 25·4 per 1000. The mortality amongst children amounts to nearly 50 per cent. of the total mortality. The hottest months are December, January, February, and March. During these months, hot winds occasionally blow. But the same dryness of the air which accounts for the great exaltation of the temperature, renders it more endurable than might at first be supposed, and Europeans are able in the hottest weather to carry on harvest-labour without danger. Careful observations, taken in the agricultural part of the colony (i. e., south of lat. 33°), and extending over a series of years, shew the mean temperature during the four hot months to average 73·60°, and during the eight cold months, 56·3°, the extreme range being from 117° to 32°. The rainfall in the north, or purely pastoral district, is as low as 7·947 inches; whilst in the south, or agricultural district, it averages as much as 48·59 inches.

Physical Aspect.—The surface of the country alternates between open plains and wooded ranges of moderate elevation, which enclose many beautiful and fertile valleys. The principal ranges are the Flinders range, which trends northward from the east coast of Spencer Gulf to the neighbourhood of Lake Torrens, in lat. 30°, where it branches out into

numerous spurs; and the Mount Lofty range, running nearly parallel with Gulf St Vincent from its head-water in lat. 34° to its termination at Cape Jarvis. The Mount Lofty ranges rise to a height of about 2600 feet, running about north-east and south-west, having a breadth of over 15 miles. This district abounds in picturesque scenery, the summits being well wooded and the slopes of great beauty and fertility, affording eligible building-sites, and producing in the highest perfection many English fruits and vegetables, which fail to thrive on the hotter and more arid soil of the plains.

Throughout S. A., the deficiency of running water is remarkable; in fact, for nearly 1200 miles, following the indentations of the coast from the western boundary of the colony to the estuary of the Torrens, in Gulf St Vincent, not even a brook of permanent fresh water finds its way into the sea. To the eastward, this deficiency is to some extent compensated, partly by the streams which take their rise in the Mount Lofty range, the principal of which are the Torrens, the Onkaparinga, the Gawler, and the Sturt, but mainly by the Great Murray. See AUSTRALIA, VICTORIA. Unfortunately for the complete utilisation of this magnificent stream, its embouchure in long. 139° E. is exposed to the full force of the Southern Ocean, which, meeting the current, throws up a shifting bar, rendering the entrance from seaward dangerous, and practicable only for steamers drawing under 7 feet. To counteract this drawback, a railway 10 miles in length has been constructed, connecting the river with Victor Harbour, a small but well-sheltered haven situated in Encounter Bay. Another railway to connect Blanch Town, situate 150 miles up the river, with Port Adelaide, in St Vincent Gulf, is contemplated, and has been completed as far as Kapunda, 57 miles, the entire distance by this line being 95 miles, which, when completed, will secure for S. A. the full advantage of this vast inland navigation.

The principal harbours are Port Adelaide in St Vincent Gulf, Port Lincoln and Port Augusta in Spencer Gulf, Victor Harbour and Port Macdonnell on the southern coast, and Nepean Bay in Kangaroo Island. Many other bays and creeks afford sufficient shelter in ordinary weather for vessels shipping produce at different points along the Sea Road.

Mineral Wealth, &c.—The mineral wealth of S. A. is great, the principal metals being copper, lead, and iron; the last is of the finest quality, but in the absence of coal, cannot be profitably worked. The principal copper-mines are the Burra and the Kapunda, to the north-east of St Vincent Gulf; the Wallaroo and Moonta, on York's Peninsula, which intervenes between St Vincent and Spencer Gulf.

Colonisation.—The country, the conformation and physical conditions of which we have above described, was selected in 1837 as the site on which to test what was then a new principle in colonisation, known as the Wakefield Theory, from the name of its author, Edward Gibbon Wakefield. The principle may be expressed in a single sentence thus: 'The waste lands of the crown, though entirely valueless prior to the application of labour and capital, acquire value according as these elements of wealth are applied to them in due proportions or otherwise; and the proceeds of the sale of these lands, if properly administered, will suffice to defray the cost of transporting the labour required for their cultivation, at the same time relieving the mother-country from the pressure of able-bodied pauperism.' A second and scarcely less important problem in economic science was put to the test on the same occasion—viz., 'The future revenues of a new colony, supplemented, if necessary, by a lien upon the lands, afford a basis of credit available for raising funds adequate to defray the cost of outfit and first settlement, and therefore the appropriation of the taxes of this country for such purposes is unnecessary and inexpedient.' Owing partly to an unfortunate delay in putting the first settlers in possession of the lands which they had paid for, but mainly to a monopoly by the government of the labour imported by the purchase-money of those lands, production was retarded during the first three years of the settlement; and the necessaries of life, which, but for this mistaken policy, might have been produced on the spot in profuse abundance, had to be imported at enormous cost, and paid for out of capital, by which means the colony was reduced to the verge of bankruptcy. In 1841, the sound principles to illustrate which the colony was founded, were, for the first time, allowed to come into play. Government interference with the labour-market ceased; and within three years from this change of policy, breadstuffs and other agricultural products were exported from S. A. in such quantities as to glut the markets which previously supplied her necessities. From that date, the progress of the colony, notwithstanding the attractions of the adjacent gold-fields, has been remarkable. The traveller may drive for many hundreds of miles over excellent roads, amidst corn-fields and vineyards cultivated by yeomen proprietors. S. A. has become the granary of the Eastern settlements; and the subjoined statements, compiled from statistics published by government, exhibit a degree of prosperity probably unsurpassed in any country or in any age.

The waste lands are disposed of in fee-simple by public auction at the upset price of 20*s.* per acre, and lands once passed the hammer, may be purchased at that price without further competition. For pastoral purposes, lands are granted to the first applicant for a lease of 14 years at an almost nominal rent. At the expiration of the first term, the run is valued by government; and if the squatter objects to that valuation, the lease is put up to auction, and sold to the highest bidder, compensation being given to the original lessee for permanent improvements constructed by him. A clause in the pastoral leases reserves to the crown power to resume portions of the land, if required, for sale to agriculturists, or for public purposes. These regulations have worked advantageously, and under them the conflict between the squatting and agricultural interests which disturbs the adjacent colonies has been avoided. The discoverer of minerals is entitled to a lease of 14 years at 10*s.* per acre, and after the expiration of the first term, the mineral-lands are put up to public competition. Great and economical facilities for the transfer of land and general dealings therewith are afforded under an act known as the Torrens Act, from the name of the author. Under this system, the difficulties, delays, and expenses attendant on the English system of conveyancing are removed, and land is rendered as easy of transfer, mortgage, and settlement as property in shipping. The great advantages secured by S. A. under this act have caused it to be adopted throughout the Australian colonies.

Government, &c.—There are two Houses of Parliament, both elective. The whole colony is thrown into one electoral district for electing members to the Council on a low property franchise, and for a period of 12 years. Members of the Assembly are elected by universal suffrage for 3 years. Voting

for both Houses is by ballot. The executive government is dependent on parliamentary majorities, as in England. No pecuniary aid is given by government to any religion, and all churches are placed on a footing of perfect equality. The system of public education is modelled on the Irish national system.

In 1881 the population of South Australia amounted to 279,865; in 1871 to 185,626, exclusive of aborigines. In the latter year the imports were of the value of £2,158,022, and the exports £3,582,397. The exports consisted chiefly of corn, wool, and copper. In the same year the total export of corn amounted in value to £1,253,429; wool to £1,170,885, and copper to £648,569. The revenue, derived principally from the sale of crown lands and customs dues, amounted to £778,094; and the public debt, spent in reproductive works, £1,944,700. In 1871 the land under cultivation amounted to 959,006 acres, of which 604,761 were wheat, 140,316 hay, 22,912 barley, 6188 oats, 6131 acres vineyards, with 6,168,758 vines. There were then in the colony 4,400,655 sheep, 136,832 cattle, 83,744 horses, 13,977 goats, 63,826 pigs, and 367,839 poultry. More than 800,000 gallons of wine were manufactured during the same year. S. A. had 133 miles of railway in 1871: the Port Line, from Adelaide to Port Adelaide, 7½ miles; and the North Line, 125½ miles, connecting Adelaide with the Burra and the copper-mines. The colony has an extensive system of electric telegraphs. An overland line, constructed at the expense of the S. A. government and opened in 1872, runs from Adelaide to Port Darwin across Central Australia, a distance of 2000 miles, and through junction with the Anglo-Indian line connects Australia with all the great centres of civilisation. The places of worship in the colony in 1871 numbered upwards of 560, with accommodations for 110,000 persons. The number of schools, in the same year, was given as 307; of scholars, 15,791; the teachers numbered 298; 94 schools were held in trust, and the average annual cost of each scholar was £1 18*s.*; the average stipend to each teacher £100 12*s.* 2*d.*

SOUTH BEND, a city of Indiana, U. S., on the south bank of the St Josephs River, near the border of Michigan, on the Southern Railway, 85 miles east of Chicago. It contains a handsome court-house, the Catholic university of Notre Dame, Female Academy and Convent, Northern Indiana College, bank, 2 newspapers, 6 churches, and large manufactories. Pop. (1870) 7206; (1880) 13,280.

SOUTH CAROLINA. See CAROLINA, SOUTH.

SOUTHCOTT, JOANNA, a curious specimen of the religious visionary, was born in Devonshire, England, of humble parentage, about 1750. In her youth she was a domestic servant, chiefly in Exeter; joined the Methodists, and becoming acquainted with a man named Sanderson, who laid claim to the spirit of prophecy, made similar pretensions herself. She received encouragement from some weak-minded clergymen of the Church of England. In 1792, she declared herself to be the woman driven into the wilderness, the subject of the prophecy in Rev. xii. She gave forth predictions in prose and verse, and although very illiterate, wrote numerous letters and pamphlets, which, as well as her prophecies in verse, or rather in doggrel, were published, and found many purchasers, and many received her pretensions as genuine. One of her productions was the *Book of Wonders.* She also issued sealed papers to her followers, which she termed her *seals*, and which, she assured them, would protect them from the judgments of God both in this and the other world, assuring their salvation. Thousands of both sexes received them with implicit confidence, among whom were men of good education and respectable position in society. At length she imagined herself to have symptoms of pregnancy, and announced that she was to give birth, at midnight on the 19th October, 1814, to a second Shiloh, or Prince of Peace, miraculously conceived, she being then more than 60 years of age. The infatuation of her followers was such that they received this announcement with devout reverence, prepared an expensive cradle, and spent considerable sums, that all might be suitable for so great an occasion. The expected birth did not take place, but on 27th December 1814, the woman died. On a post-mortem examination, it was found that the appearance of pregnancy which had deceived others, and perhaps herself, was due to dropsy. She was privately buried in London. Her followers, however, were not to be undeceived, and continued to believe that she would rise again from her 'trance,' and appear as the mother of the promised Shiloh. In 1851, according to the census returns, there were still four congregations of Southcottians in England. Unfortunately, the census returns of 1861 afford us no information on such subjects. Some passages in her absurd prophecies are of rather a practical character, as the following: 'I am the Lord thy God and Master: Tell I—— to pay thee five pounds for expenses of thy coming up to London; and he must give thee twenty pounds to relieve the perplexity of thy handmaid and thee, that your thoughts may be free to serve me the Lord, in the care of my Shiloh.' This was published in 1820. The Lord is also made to inform his people somewhere, anxious to go to meet the Shiloh at Manchester, that travelling by the new cut is not expensive.

The history of Joanna S. herself has not much in it that is marvellous; but the influence which she exercised over others may well be deemed so, and the infatuation of her followers is hard to be understood, particularly when it is considered that some of them were men of some intelligence and of cultivated mind. Probably the secret of her influence lay in the fact that the poor creature was in earnest about her own delusions. So few people in the world are really so, that they are always liable to be enslaved by others who have convictions of any kind, however grotesque. On her deathbed, Joanna said: 'If I have been misled, it has been by some spirit, good or evil.' She knew that she was not 'hersel' (as the Scotch say), when she prophesied; but she was of too mean an order of intelligence to understand that she was mad, and therefore preferred to attribute her delusions to the Deity, or, as she said at the last moment with pathetic half-penitent vacillation, to 'some spirit, good or evil.' Poor Joanna never suspected that the spirit which played such vagaries was her own.

SOUTHERNWOOD. See ARTEMISIA.

SOUTHEY, ROBERT, was born 12th August 1774, at Bristol, in which city his father was a linen-draper. In 1788, he was sent to Westminster School by his maternal uncle, the Rev. Herbert Hill, chaplain to the English factory at Lisbon, who undertook the charge of his education, his father's pecuniary affairs having become much embarrassed. At Westminster, he much distinguished himself; but in 1792 a trivial insubordination led to his expulsion; and next year he was entered at Balliol College, Oxford, with a view to his taking orders. This, however, he ultimately declined to do, having been led by his sympathy with the French Revolution, into a considerable departure from the orthodox civil and religious standards. In 1794, he left Oxford, having published the year before, in conjunction

with his friend Robert Lovell, a small volume of poems, the first literary venture of a life thenceforward to be almost wholly devoted to literature. Shortly after, he received from Cottle, for his first poem of any length, *Joan of Arc*, the sum of £50; and in November 1795, he was married to a Miss Fricker of Bristol; Coleridge, with whom he had become intimate, on the same day marrying a sister. After passing some little time with his uncle in Portugal, engaged in a diligent study of the language and literature of that country and of Spain, he became a student of law at Gray's Inn. Here he worked at his new poem of *Madoc*, and learned nothing whatever of law, a pursuit which he speedily relinquished as hopeless. In 1801, he accepted a situation as secretary to Mr Corry, Chancellor of the Exchequer for Ireland; but finding its duties distasteful to him, he very soon threw it up, and finally betook himself to literature as his sole source of livelihood.

In 1804, he settled himself at Greta Hall, near Keswick in Cumberland, where he spent the remainder of his life, working with the regularity of a machine, happy in his family relations and his unremitting daily round of congenial, though continuous toil. His biography thence onward for forty years, till the pen dropped from his fingers, might be summarised in the list of his works, which of itself would fill a page or two. In addition to these formal publications, he wrote largely for various periodicals, notably for the *Quarterly Review*, to which, from its establishment in 1809—having now become as violently conservative in his views as in youth he had been revolutionary—he was a most constant and valued contributor.

In 1807, in consideration of his services to literature, a pension of £160 per annum was awarded him; and in 1813, on the death of Mr Pye, he succeeded him as Poet Laureate. Through Sir Robert Peel, in 1835, he received a further pension of £300, and along with it the offer of a baronetcy, which, however, he decided to decline. His first wife dying in 1837, he, two years after, was married to Miss Caroline Bowles. On March 21, 1843, he died, his few last years having for the most part been passed in a state of painful mental stupor, which incapacitated him for literary exertion.

S.'s poetry—except in a few of his shorter ballad pieces—can at no time be said to have been popular, and is now nearly forgotten. His chief works are *Madoc*, *Thalaba*, *The Curse of Kehama*, and *Don Roderick*, of which the last two are reckoned the best. In all of them are to be found noble passages, in which an ample and stately rhetoric counterfeits with surprising success the pure instinct of music; but they rather skilfully illustrate the art and technic of poetry than breathe its essential life. As a prose writer, he ranks high; his style is easy, lucid, agreeable, nicely modulated throughout, and readily rising into eloquence on suggestions of sentiment and subject. But of all his multifarious writings in this kind, his little *Life of Nelson* seems most likely to survive as a classic. The most popular of his works when produced, it continues to be admired as, within the assigned limits, an almost perfect model of biography. Other very excellent biographies, however, are those of the poet Cowper, of Bunyan, and Wesley. His Life and Correspondence, edited by his son, was published in 6 vols. (1849); and a Selection from his Letters, edited by his son-in-law, in 4 vols. (1856).

SOUTH or STEWART ISLAND, the most southern of the islands which form the British colony of New Zealand (q. v.).

SOUTHMO′LTON, a municipal borough in the north of Devonshire, 11 miles east-south-east of Barnstaple. Woollen goods are manufactured. Pop. (1871) 3978; (1881) 3340.

SOU′THPORT, a fashionable bathing-place in Lancashire, on the south shore of the estuary of the Ribble, 19 miles north of Liverpool. It is a handsome town, and is almost wholly of recent erection. There are assembly-rooms, libraries, large hotels, &c.; the sands are good, and there is an iron pier nearly a mile long. The rapidity with which S. has risen in public favour as a watering-place, is the best evidence of its salubrity and beauty. Pop. (1851) 5391; (1861) 11,303; (1870) 18,085; (1880) 32,191.

SOUTH SEA SCHEME, THE, commonly designated the SOUTH SEA BUBBLE, a term peculiarly expressive of its hollow and ephemeral splendour and sudden collapse, was originated by Harley (q. v.), Earl of Oxford, in 1711, with the view of restoring public credit, and providing for the extinction of the floating national debt, which at that time amounted to £10,000,000. This debt was taken up by a number of eminent merchants, to whom the government agreed to guarantee for a certain period the annual payment of £600,000 (being 6 per cent. interest), a sum which was to be obtained by rendering permanent a number of import duties. The monopoly of the trade to the South Seas was also secured to these merchants, who were accordingly incorporated as the 'South Sea Company,' and at once rose to a high position in the mercantile world. The wondrously extravagant ideas then generally current respecting the riches of the South American continent, were carefully fostered and encouraged by the Company, who also took care to spread the belief that Spain was prepared, on certain liberal conditions, to admit them to a considerable share of its South American trade; and, as a necessary consequence, a general avidity to partake in the profits of this most lucrative speculation sprung up in the public mind. It may be well to remark in this place, that the Company's trading projects had no other result than a single voyage of one ship in 1717, and that its prominence in British history is due entirely to its existence as a purely monetary corporation. Notwithstanding the absence of any symptoms of the carrying out of its great trading scheme, the Company had obtained a firm hold on popular favour, and its shares rose day by day; and even when the outbreak of war with Spain in 1718 deprived the most sanguine of the slightest hope of sharing in the treasures of the South Seas, the Company continued to flourish. Far from being alarmed at the expected and impending failure of a similar project—the Mississippi Scheme (q. v.)—the South Sea Company believed sincerely in the feasibility of Law's scheme, and resolved to avoid what they considered as his errors. Trusting to the possibility of pushing credit to its utmost extent without danger, they proposed, in the spring of 1720, to take upon themselves the whole national debt (at that time £30,981,712), on being guaranteed 5 per cent. per annum for 7½ years, at the end of which time the debt might be redeemed if the government chose, and the interest reduced to 4 per cent. The directors of the Bank of England, jealous of the prospective benefit and influence which would thus accrue to the South Sea Company, submitted to government a counter-proposal; but the more dazzling nature of their rival's offer secured its acceptance by parliament—in the Commons by 172 to 55, and (April 7) in the Lords by 83 to 17; Sir Robert Walpole in the former, and Lords North and Grey, the Duke of Wharton, and Earl Cowper in the latter, in vain protesting against it as involving

inevitable ruin. During the passing of their bill, the Company's stock rose steadily to 330 on April 7, falling to 290 on the following day. Up till this date, the scheme had been honestly promoted; but now, seeing before them the prospect of speedily amassing abundant wealth, the directors threw aside all scruples, and made use of every effective means at their command, honest or dishonest, for keeping up the factitious value of the stock. Their zealous endeavours were crowned with success; the shares were quoted at 550 on May 28, and 890 on June 1. A general impression having by this time gained ground that the stock had reached its maximum, so many holders rushed to realise, that the price fell to 640 on June 3. As this decline did not suit the personal interests of the directors, they sent agents to buy up eagerly; and on the evening of June 3, 750 was the quoted price. This and similar artifices were employed as required, and had the effect of ultimately raising the shares to 1000 in the beginning of August, when the chairman of the Company and some of the principal directors sold out. On this becoming known, a widespread uneasiness seized the holders of stock, every one was eager to part with his shares, and on September 12 they fell to 400, in spite of all the attempts of the directors to bolster up the Company's credit. The consternation of those who had been either unwilling or unable to part with their scrip, was now extreme; many capitalists absconded, either to avoid ruinous bankruptcy, or to secure their ill-gotten gains, and the government became seriously alarmed at the excited state of public feeling. Attempts were made to prevail on the Bank to come to the rescue by circulating some millions of Company's bonds; but as the shares still declined, and the Company's chief cashiers, the Sword-blade Company, now stopped payment, the Bank refused to entertain the proposal. The country was now wound up to a most alarming pitch of excitement; the punishment of the fraudulent directors was clamorously demanded; and parliament was hastily summoned (December 8) to deliberate on the best means of mitigating this great calamity. Both Houses, however, proved to be in as impetuous a mood as the public; and in spite of the moderate counsels of Walpole, it was resolved (December 9) to punish the authors of the national distresses, though hitherto no fraudulent acts had been proved against them. An examination of the proceedings of the Company was at once commenced; and on Walpole's proposal, nine millions of South Sea bonds were taken up by the Bank, and a similar amount by the East India Company. The officials of the Company were forbidden to leave the kingdom for twelve months, or to dispose of any of their property or effects. Ultimately, various schemes, involving the deepest fraud and villainy, were discovered to have been secretly concocted and carried out by the directors; and it was proved that the Earl of Sunderland, the Duchess of Kendal, the Countess Platen and her two nieces, Mr Craggs, M.P., the Company's secretary, Mr Charles Stanhope, a Secretary of the Treasury, and the Sword-blade Company, had been bribed to promote the Company's bill in parliament by a present of £170,000 of South Sea stock. The total amount of fictitious stock created for this and similar purposes was £1,260,000, nearly one-half of which had been disposed of. Equally flagrant iniquity in the allocation of shares was discovered, in which, among others, Mr Aislabie, the Chancellor of the Exchequer, was implicated. Of these offenders, Mr Stanhope and the Earl of Sunderland were acquitted, through the unworthy partiality of the parliament; but Mr Aislabie and the other directors who were members of the House of Commons, were expelled; most of the directors were imprisoned, and all of them suffered confiscation of their possessions. The chairman was allowed to retain only £5000 out of £183,000, and others in proportion to their share in the fraudulent transactions of the Company. At the end of 1720, it being found that £13,300,000 of real stock belonged to the Company, £8,000,000 of this was taken, and divided among the losers, giving them a dividend of 33⅓ per cent.; and by other schemes of adjustment, the pressure of loss was so fairly and widely distributed, that the excitement gradually subsided. Contemporary with this great gambling scheme were numerous other 'bubbles,' most of them based upon the most shadowy foundations, and projected for the achievement of the most frivolous and even absurd ends; but none of them rose to such importance as the South Sea Scheme, though collectively they added greatly to the general distress of the period, till they were suppressed by act of parliament, 12th July 1720.—See Coxe's *Walpole*, *Bubbler's Medley*, published by Carrington Bowles, Mackay's *Popular Delusions*, and the various histories of England during this epoch.

SOUTH SHETLAND, or NEW SOUTH SHETLAND, a group of islands and a tract of what is supposed to be mainland in the South Atlantic, about 600 miles south of Cape Horn, in lat. 60° 32′—67° 15′ S. Of the islands, which are destitute of vegetation, with the exception of a species of moss, the chief are Livingston, Cornwallis, King George, Clarence, and Elephant Islands. The most recent explorers in this region are Biscoe in 1832, and Sir J. Ross in 1842.

SOU′THWARK. See London.

SOU′THWELL, a small market-town of considerable antiquity in Notts, 12 miles north-east of Nottingham. At S., Charles I. surrendered himself to the Scotch commissioners.

SOUVA′LKY, chief town of the government of Souvalky (Poland), is situated on the left bank of the river Charnagarche, a tributary of the Niemen, 538 miles south-west of St Petersburg. Pop. 16,533.

SOUZDA′L, a town of European Russia, in the government of Vladimir, noted as being one of the oldest towns in Russia, having, according to certain accounts, been founded 606 B.C. Pop. 6919.

SO′VEREIGN, the name applied in politics to the person or body of persons in whom the legislative power of a state is vested. In limited monarchies, sovereignty is in a qualified sense ascribed to the king, who, though the supreme magistrate, is not the sole legislator. A state in which the legislative authority is not trammelled by any foreign power, is called a sovereign state. The states of the German Empire were designated *mi-souveraines*, because their sovereignty was qualified by their subordination to the imperial authority; and the same term may be applied to the states of the American Union.

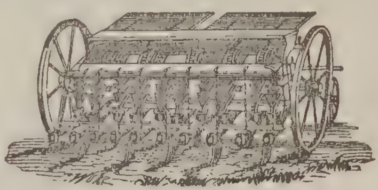
SOVEREIGN, an English gold coin of the value of twenty shillings sterling, the standard weight of which is 123·374 grains troy. The name was first applied to a gold coin issued in the reign of Henry VIII., otherwise called the double royal or rial, on which the king was represented in the royal robes. The name disappeared after a few reigns, and was revived as applicable to the gold piece of George III., issued in 1817, of the value of twenty shillings, which was substituted for the guinea, which had previously been current, of the value of twenty-one shillings.

SOWBREAD. See CYCLAMEN.

SOWERBY BRIDGE, a small manufacturing town in the West Riding of Yorkshire, three miles south-west of Halifax. It contains iron-works, malting-houses, corn-mills, worsted and cotton factories, chemical works, and dye-works; but the woollen manufacture is the principal branch of industry. Pop. (1861) 5382; (1881) 8721.

SOWING AND SOWING-MACHINES. Sowing is the deposition in the ground of the *seeds* of cultivated plants, and while agriculture was yet in a rude condition, was always performed by scattering the seeds from the hand over the prepared surface of the soil. This mode, distinguished as *hand-sowing*, is still employed in garden husbandry for sowing the seeds of kitchen vegetables; but in the more extensive operations of the farm, it has been very much superseded by the use of sowing-machines of various kinds—the broadcast sowing-machine, the drilling-machine, and the dibbling-machine; the first being employed exclusively for cereals and grasses, the other two for any kind of crop. The preparation of the soil for the reception of the seed consists in the thorough removal from it, or destruction, of weeds; in its reduction to as fine a state of division as possible by means of the plough, grubber, harrow, and roller, and in the application of the fitting manures. Attention must also be paid to the seed to be sown, that it be mature, unmixed, and each seed perfect in itself. Defect in the first two must be guarded against in the selection of seed; in the third, which is due to mechanical damage or to the presence of some of the numerous fungoid growths which infest the seeds of plants, is generally remedied by 'steeping' the seed previous to sowing it. The 'steeps' employed are of two sorts, acid and alkaline, the former acting directly on the fungoid sporules and the bruised grains, and destroying their vitality; the latter converting the oily matter which attaches the sporules to the grains into soap, and so detaching them by the aid of a little stirring. Of the acid steeps, blue vitriol or sulphate of copper ($Cu_2SO_4.5H_2O$) in the proportion of $\frac{1}{2}$ lb.—1 lb. to as much water as will cover 4 bushels of grain, is the best of all steeps, and is the one most commonly employed; the others are green vitriol or sulphate of iron ($Fe_2SO_4.7H_2O$), and various arsenical preparations. The alkaline steeps, which are inferior to the former, being more limited and less certain in their action, are putrid urine, lime-water of maximum strength, and Glauber's Salts or sulphate of soda, to the last of which lime is added with advantage. Concentrated salt brine was formerly much used and strongly recommended, but its efficacy is at best doubtful. After the seed has been steeped, it ought to be spread out on a floor in thin layers to dry, after which it should be at once sown. The sowing and the accompanying operations on the soil vary necessarily with the species of grain.

Cereals.—As above mentioned, cereals may be sown either broadcast, drilled, or dibbled. If the first method is to be adopted, the land, after being sufficiently pulverised, is again lightly ploughed, receiving what is called the seed-furrow, and the seed is then sown either by hand or by the broadcast machine. This machine consists of a triangular frame with the apex to the front, supported on three wheels, and carrying a long wooden box of the form of a triangular prism, set with a flat side—the lid—uppermost. This box, which is placed at right angles to the line of draught, is furnished with a row of small holes at the bottom, about 7 inches apart; and a little above this row is placed a longitudinal spindle, carrying a set of hard circular brushes, one opposite each hole, and deriving a rotatory motion from the axle of the hind wheels. The size of the apertures can be adjusted to the desired quantity of seed per acre, by means of a movable plate outside provided with holes corresponding to those of the box. When the box is supplied with seed, and the machine set in motion, the grain drops through the holes, which are kept from clogging by the rapid rotation of the brushes. The box is made of such a length (15—18 feet) that when the horse walks in the furrow, two adjacent half-ridges are sown at once. The grain is thus deposited with much more regularity than by the best hand-sowing, far less seed is used, and 25—30 acres can be sown per day. The seed is then covered by harrowing. This machine is much used in Scotland, being better suited to hilly and uneven surfaces, and, from its more rapid execution, to a climate which more frequently interferes with agricultural operations. In England, where the climate is more favourable, and the surface more level, the drilling-machine is the favourite. The land is now prepared for sowing by as complete pulverisation as possible, and its surface is made quite even by the harrow and roller. The drill (fig.), which in the arrangement of some of



Corn-drill.

its essential parts corresponds to the broadcast machine, differs from it in being furnished with a set of coulters, which are hollowed behind to enclose the lower ends of a corresponding set of tin tubes, whose upper ends are fixed opposite to the holes in the seed-box. By this machine, a series of furrows of uniform depth are made by the coulters; into these furrows the seed is conveyed by means of the tin tubes, and is then covered over by the harrows, one double turn being generally sufficient. The spindle inside the seed-box is provided with grooved cylinders or pinions in place of brushes, and the seed-rows are generally made about 10—12 inches apart. The advantages of this machine over the former consist in the greater regularity of deposition of the seed, which admits of hoeing and other cleaning operations during the early period of growth; in the uniform depth at which the seed is planted, so that none of it is lost by being buried; in the protection of the operation from the disturbing influence of winds; in the saving of seed and greater yield of grain; it being often found that if drilled seed be to broadcast, in quantity, as 2 to 3, their respective yields are nearly as 5 to 4. The benefits of drilling are more noticeable with autumn-sown crops, and on poor or light soil. But it has one disadvantage: a 9-foot drill (the largest size), cannot sow more than 10—12 acres per day, and employs more men and horses than the simpler machine.

The third method of sowing, by dibbling, is employed chiefly on the light soils in the south of England, and even there not generally, at least in the case of cereals, so that a minute description of the machines by which the operation is effected is unnecessary. Suffice it to mention that dibbling

only requires about one-third of the seed which is necessary in drilling, and presents still greater opportunities for weeding and stirring the soil in the early stages of growth; but is attended with various important defects, and is more expensive.

When a cereal crop is to be followed by grass, the grass seeds are sown some time after the other crop, by a broadcast machine.

Beans.—The sowing of this crop (see BEAN) is performed by means of the *bean-barrow*, a machine the same in structure as the drilling-machine for corn, but wanting the coulters, and having only three tubes, through which the seeds fall. Peas are frequently sown along with beans, the latter acting as a support to the former, and the two together better preventing the growth of weeds.

Turnips.—For this crop the ground must be more thoroughly cleaned and broken down than for any other; after which it is formed into drills 27 inches apart, which are then supplied with manure and covered in the same way as after bean-sowing. The new ridges thus formed being directly above the manure, the seeds are sown on the top of each ridge by means of the *turnip-drill.* This machine, instead of a seed-box of the ordinary form, has two tin or tinned-iron barrels, placed on a spindle. Each cylinder has a row of holes round its middle circumference, the row being covered by a circular sliding collar of thin metal, perforated with corresponding holes, and like the iron bar of the corn-drill, capable of modifying to any extent the outflow of seed. Each seed-box has its corresponding seed-tube and hollow coulter, as in the corn-drill; but the turnip-machine has in addition a large roller in front of the coulters, for compressing the crests of the ridges, and two light rollers attached behind, which slightly compress the earth raised by the coulters, and cover the seeds. The quantity of seed sown is about 2 lbs. of globe or yellow, and 3 to 4 lbs. of Swedish turnips to the acre.

SOW THISTLE (*Sonchus*), a genus of plants of the natural order *Compositæ*, suborder *Cichoraceæ*, having an imbricated involucre, swollen at the base, with two rows of unequal scales, which at length bend inwards; a naked receptacle; the fruit transversely wrinkled and without a beak, the pappus hairy and without a stalk. The COMMON S. T. (*S. oleraceus*) abounds in Britain and in most parts of Europe, as a weed in gardens and cultivated fields. It is an annual plant, delighting in rich soils, grows to the height of two or three feet, with somewhat branching stem, and small yellow flowers almost in umbels. The tender tops and leaves are much used in the north of Europe as greens.—The CORN S. T. (*S. arvensis*) is a perennial with large yellow flowers, frequent in corn-fields in Britain, and throughout great part of Europe.—Nearly allied to the genus *Sonchus* is *Mulgedium*, to which belongs the ALPINE BLUE S. T. (*M. alpinum*), the beautiful blue flowers of which adorn some of the most inaccessible spots of the mountains of Switzerland and of Scotland.

SOY is a thick and piquant sauce, made from the seeds of the SOY BEAN (*Soja hispida*), a plant of the natural order *Leguminosæ*, suborder *Papilionaceæ*, so nearly allied to the genus Dolichos (q. v.) as to be often included in it. It is a native of China, Japan, and the Moluccas, and is much cultivated in China and Japan. It is also common in India, although, probably, not a native of that country. The seeds resemble those of the Kidney Bean, and are used in the same way. The Japanese prepare from them a substance called *Miso*, which they use as butter.

Soy is made by mixing the beans softened by boiling with an equal quantity of wheat or barley roughly ground. The mixture is covered up, and kept for 24 hours in a warm place, to ferment. The mass is then put into a pot, and covered with salt, the salt used being in quantity about equal to each of the other ingredients. Water is poured over it; and it is stirred, at least once a day, for two months, after which the liquor is poured off and squeezed from the mass, filtered, and preserved in wooden vessels. By long keeping, it becomes brighter and clearer. A Chinese sauce, called *Kitjap* (Ketchup), is often sold in Britain as soy, but is very inferior to the true soy.

SPA, a town of Belgium, and a watering-place of world-wide celebrity, stands in a romantic valley amid hills which form part of the Ardennes chain, 27 miles south-east of Liége, and 22 miles south-west of Aix-la-Chapelle by railway. The prettily-built town consists almost entirely of inns and lodging-houses. The chief edifices are the *Redoute*—plain outside, but handsome within, and including under one roof a theatre (open four times a week), a ball-room, gambling-rooms, &c.—and the *Vauxhall*, a second Redoute, but now little used. The mineral springs, seven in number, are all chalybeate, and contain minute quantities of iron, so combined with alkaline salts and carbonic acid gas as to be both easily digested and agreeable to the palate. They are cold, bright, and sparkling, and are efficacious in complaints of the liver, nervous diseases, dyspepsia, &c. Spa-water is exported to all quarters of the globe. The other springs are in the vicinity of the town, and most of them are situated amid picturesque plantations. S. is also famed for the manufacture of wooden toys, which are stained brown by being steeped in the mineral waters. Pop. of the town 5881. The number of visitors during the season is about 20,000, of whom half are Belgians. S. was frequented as a watering-place as early as the 14th c., and has given its name to many mineral springs.

SPACCAFORNO, a city of Sicily, province of Noto, with 7411 inhabitants. Opposite S., Roger, king of Sicily, gained a signal victory over the Saracens in 1092.

SPACE AND TIME. Space and Time being the most general conditions, forms, or attributes of all existing things, their discussion is linked with the highest problems of philosophy. Space is co-extensive with, and inseparable from, the sensible external, or Object World; time is a property both of the Object World and of the Subject Mind.

Of the so-called Innate Ideas maintained by one school of philosophy, Space and Time are the foremost examples. (Other examples are Number, Infinity, Being, Substance, Power, Personal Identity, &c.) Accordingly, it is held, on the one side, that these notions are underived, or intuitive to the mind; and, on the other side, that they arise in the course of our education or experience, like our ideas of heat, sound, colour, gravity, &c.

To begin with Space. The supporters of the innate or intuitive origin of the idea allow that it does not arise in the mind until actual objects, or extended things are presented to the senses—until we see the visible, and touch the tangible things around us; but they declare that this contact with the sensible world is only the *occasion* of our becoming conscious of what was already in the mind. Thus, Mr. Mansel says: 'Space is not properly an *innate idea*, for no idea is wholly innate; but is

is the innate element of the ideas of sense which experience calls into consciousness.' It is, in short, the superadding of some independent activity of the mind to the passive sensation. The reasons usually given for assuming an intuitive element in the idea of Space are, in the main, the reasons given for innate ideas generally; they chiefly resolve themselves into affirming the attributes of *universality* and *necessity* in such ideas, and the inadequacy of mere sensible experience to reveal these high attributes of things. Whatever is got by experience can be thought away; Space and Time cannot. Thus, it is impossible for us to receive any sensible impression of an outward object—the sun, for example—without conceiving that thing as existing in space. To use the language of Kant, Space is a form of our sensibility, or sensible perception; and as the perception itself cannot, he thinks, give this universal and inseparable form—it must be contributed by the mind. Sir W. Hamilton supposes that we may have an 'empirical' notion of Space—i. e., a notion from experience; but that Space as a 'form' is not obtained from experience, but from intuition. He does not, however, explain clearly wherein consists the difference between these two notions.

According to the opposite view, Space is an abstraction from our experience of extended things, exactly as gravity is an abstraction from gravitating bodies, and justice from just actions. We first obtain from experience a variety of impressions, in the concrete, of things possessing extension; and, next, from all these, by the usual process of abstraction, we gain a notion of extension in the abstract, or Space. A few remarks may be made on these two distinct operations, as both involve matters of controversy.

1. Before the Muscular Feelings were distinctly recognised as something superadded to the proper sensations of the senses—or the feelings of mere light, sound, &c., it was not easy to shew that, by sensible experience alone, we could perceive objects as extended, or as occupying space. The pure optical sensibility of the eye is for colour solely; the pure tactile sensibility is for softness and smartness, roughness and smoothness, &c. When, however, we make full allowance for the whole range of feeling connected with the exercise of muscular energy, there is no difficulty in accounting for the origin of such notions as Resistance (Force or Power) and Extended Magnitude. The element supposed, by the *à priori* philosophers, to be contributed by the mind itself, is, according to the other school, Muscularity, or the feeling of the putting forth of inward energy. The two senses related to our cognizance of Space—Sight and Touch, are compound senses; they involve an active energy, with its peculiar consciousness, as well as a passive sensibility; and all that is characteristic of Extension, or Space, arises through these muscular accompaniments.

2. Having perceived a great number of things as extended, with the intervals of unoccupied extension that separate these, we form an idea of extension in the abstract. The distinguishing peculiarity of this abstraction is related to *unoccupied* extension, or empty space, where we seem to have extension without anything extended; rendering the idea of Space unlike other abstract ideas, as Gravity, or Justice, which are conceivable only as embodied in gravitating things, or just actions. Still, empty space is a reality to us, inasmuch as it expresses cessation of resistance, and free scope for movement. To the senses alone, without the muscular accompaniments, Space would be a nonentity, an inconceivability; but the feeling of the sweep of the arm, or of the locomotion of the body, in passing from one point of resistance to another, is a genuine mental experience—the filling up of the interval between two tactile encounters, or between two optical pictures, with conscious activity.

The idea of TIME, continuance, or endurance, applies both to our feelings of energy put forth, and also to our sensations, emotions, and the flow of our ideas; in other words, it attaches both to the extended or Object World, and to the unextended or Subject Mind. In our muscular feelings, which represent the universe of matter and space, we discriminate a dead strain, or effort of resistance, lasting a short time, from the same strain lasting a longer time; and also a more persisting movement from a less. So in the sensations; a sound enduring a second is different to us from a sound enduring two seconds: a transitory odour is not confounded with one of greater continuance. We distinguish two bursts of wonder, terror, love, or anger, if they have been unequal in their duration. Abstracting from all these experiences of continuance in the concrete, we obtain the idea of Time; which idea, however, like other abstractions, must be conceived by us under some individual continuing thing. If we were to imagine the whole outward universe annihilated, we should still have, in our own consciousness, an instance of the continuing, and upon that we could sustain the conception of Time. See GENERALISATION.

Time is measured by Space, and Space by Time. The one is often expressed by the other, but with a certain limitation; we say 'a space of time,' but not a 'time of space.' Movement is common to both. Of passive sensations, the best for indicating time are those of Hearing.

SPADE-HUSBANDRY, COTTAGE-FARMING, AND FIELD-GARDENING, are phrases of synonymous meaning, and denote the cultivation of farm-crops on a small scale by means of the spade. This system has long been in operation in Belgium and Flanders, where the holdings average little more than five, though a few are as large as forty acres; and by steady industry and economy, even the smallest of them is capable of maintaining a family in comfort. In Great Britain cottage-farming is chiefly practised among the miners in Cornwall, who at first received leases of their coarse unreclaimed land at 2s. 6d.—5s. per acre, the lease to last for three lives. These patches of from three to five acres now number more than 6000, and have increased 400 per cent. in value. In Lincolnshire, especially on the isle of Axholme, the same system prevails; but there the soil is naturally rich and deep; yet, though the farms are many of them very small, their occupants are well off, and about one-fourth of them have become owners of the land they cultivate. The success of small-farming depends on two causes—the inexpensiveness of the stocking and implements, and the superior fertility of the soil when dug. The implements required are—spades and digging-forks of different sizes, hoes, rakes, scythe, reaping-hooks, flail, hayfork, wheelbarrow, and a few other implements equally inexpensive; the steading consists of the cottage, a cow-shed (for one or two cows), and a pig-sty; the stock, of cows, pigs, and poultry, besides household furniture; and all of these, implements, steading, and stock, may be provided for a farm of 4—6 acres at a cost of about £110. At the end of 4 or 5 years, the land being by this time brought into good condition, a clear profit of £22 annually may be expected. The superiority of the spade over the plough rests on its deeper cultivation, on its not forming a hard impermeable crust on the surface of the subsoil, as the

plough does, on its more thorough subdivision of the soil, and on its more effective burying of weeds. As a conclusive instance of this, may be given a sketch of the system pursued by the Rev. Mr Smith of Lois-Weedon, Northamptonshire, with its results. Mr Smith drilled wheat in the usual manner, dug the intervals two spits deep, so as gradually, year by year, to bring up more and more of the subsoil, and by careful keeping down of weeds, repeated stirring of the soil, and sowing the next crop in the intervals between the rows of the former, he succeeded at a total expense of £3, 14s. per acre, in obtaining a profit of £8 per acre. Mr Smith also sowed wheat in strips of three rows, with twelve inches between the rows, and intervals of three feet between the strips; and by dint of thorough digging and trenching between the rows with the spade, he succeeded for 14 successive years in producing 36 bushels of wheat annually, without the application of a particle of manure. Similar experiments have been made with success at Rothamstead in Herts, by Mr Lawes, who found, however, that proper and sufficient manuring almost doubled the crop. The subject of cottage-farming deserves serious attention in connection with the movement for ameliorating the condition, and preventing the decrease, of the rural population of the country.

SPA'DIX. See SPATHE.

SPAGNOLET'TO. See RIBERA.

SPA'HIS (the same with *Sipahi*, or Sepoy, q. v.) were the cavaliers furnished by the holders of military fiefs to the Turkish army, and formed the élite of its cavalry. The S., along with the Janizaries (q. v.), owe their organisation primarily to Orchan, the second of the Ottoman sultans, finally to Sultan Amurath I.; and when levied *en masse*, could number 140,000, but such a levy was very seldom called for. In the field, they were divided into two classes, distinguished by the colour (red and yellow) of their standards; one class had pistols and carbine, the other a bow and arrows, and both carried a sabre, lance, and *jerid*, or javelin. They were excellent irregular troops; but when European organisation was introduced into the Turkish army, they were replaced (1826) by regular horse. At the present time, the French have numerous regiments of Spahis, raised from among the native tribes of Algeria and from France in about equal proportions; the dress, especially of the indigenous soldiers, partakes very much of the Arab character. The natives are allowed to rise to any grade below that of captain; but all the superior officers are of French descent.

SPAIN (Span. *España*), a kingdom of Europe, occupying the larger portion of the great peninsula which forms the south-west corner of the European continent, reaching further south than any other European country, and further west than any except Portugal. It is bounded on the N. by the Bay of Biscay and by France, from which it is separated by the mountain ridge of the Pyrenees; on the E. and S., by the Mediterranean and Atlantic; and on the W. by the Atlantic and Portugal. Greatest length, from Fuenterrabia on the north to Tarifa on the south, 560 miles; greatest breadth, from Cape Finisterre (Land's End), the extreme point on the west, to Cape Creuze, the extreme point on the east, about 650 miles; average breadth about 380 miles. Area, including the Balearic (q. v.) and Canary Isles, 196,031 sq. m.; pop. (1877) 16,634,345. The country, including the Balearic and Canary Isles, was divided in 1834 into 49 modern provinces, though the former division, into 14 kingdoms, states, or provinces, is still sometimes

used. The following is a table of the ancient states, and of the modern provinces into which they have been divided, with their areas and populations, according to the most recent published estimates by the best authorities:

Ancient Provinces.	Modern Provinces.	Area in Eng. Sq. Miles.	Population.
NEW CASTILE.	Madrid,	2,997·2	487,482
	Toledo,	5,586·3	342,272
	Guadalajara,	4,869·3	208,638
	Cuenca,	6,725·9	238,731
LA MANCHA.	Ciudad-Real,	7,840·3	264,649
OLD CASTILE.	Burgos,	5,651·0	353,560
	Logroño,	1,945·1	182,941
	Santander,	2,112·7	241,581
	Soria,	3,836·3	158,699
	Segovia,	2,713·5	150,812
	Avila,	2,981·7	175,219
	Palencia,	3,126·5	184,668
	Valladolid,	3,042·7	242,384
LEON.	Leon,	6,166·9	350,092
	Zamora,	4,135·6	250,968
	Salamanca,	4,940·0	280,870
ASTURIAS.	Oviedo,	4,091·3	610,883
GALICIA.	Coruna,	3,078·6	630,504
	Lugo,	3,787·3	475,836
	Orense,	2,738·7	402,796
	Pontevedra,	1,739·2	480,145
ESTREMADURA.	Badajos,	8,687·8	431,922
	Caceres,	8,013·9	302,455
ANDALUCIA.	Seville,	5,295·5	515,011
	Cadiz,	2,809·3	426,499
	Huelva,	4,122·4	196,469
	Cordova,	5,190·1	382,652
	Jaen,	5,184·2	392,100
	Granada,	4,937·6	485,346
	Almeria,	3,302·5	361,553
	Malaga,	2,823·7	505,010
MURCIA.	Murcia,	4,477·9	439,067
	Albacete,	5,971·8	220,973
VALENCIA.	Valencia,	4,352·2	665,141
	Alicante,	2,098·3	440,470
	Castellon de la Plana,	2,446·6	292,222
ARAGON.	Zaragoza,	6,607·4	401,894
	Huesca,	5,878·5	274,623
	Teruel,	5,494·2	252,201
CATALONIA.	Barcelona,	2,985·3	762,555
	Tarragona,	2,451·4	350,395
	Lerida,	4,774·8	330,348
	Gerona,	2,271·9	325,110
BASQUE PROVINCES.	Navarre,	4,045·8	318,687
	Biscay,	848·6	187,926
	Guipuzcoa,	727·7	180,743
	Alava,	1,205·3	103,320
	Total	191,110·8	16,262,422
ISLANDS.	Balearic,	1,736·7	289,225
	Canaries,	3,183·6	283,859
	General Total	196,031·1	16,835,506

The colonial possessions of Spain consist of the following

Colonies.	Area in Eng. Sq. Miles.	Population.
I.—AMERICA.		
Cuba (1867),	45,708	1,414,508
Porto Rico (1864),	3,582	646,362
	49,290	2,060,870
II.—ASIA AND OCEANICA.		
Philippine Islands,	65,385	4,319,269
Caroline Islands and Palaos,	915	23,580
Marianes, or Ladrones,	415	5,610
	66,715	4,348,459
III.—AFRICA.		
Guinea Islands,	465	5,590
Total,	116,470	6,384,131

Coast-line.—The entire perimeter of the country is 2080 English miles, and the coast-line, exclusive of windings, is 1317 miles long, of which 712 miles are formed by the Mediterranean, and 605 miles by the Atlantic. The north coast, from Fuenterrabia west to Cape Ortegal, is unbroken by any considerable indentation. A wall of rocks, varying in height

from 30 to 300 feet, runs along this shore; but the water, which retains considerable depth close to the beach, is not interrupted to any unusual extent by islands or rocks. The north-west coast, from Cape Ortegal south to the mouth of the river Minho —which separates the Spanish province of Galicia from Portugal—though rock-bound, is less elevated, and is much more broken than the shores washed by the Bay of Biscay; and the indentations, the chief of which are Noya Arosa and Vigo Bays, form secure and spacious harbours. From the mouth of the Guadiana, on the south, to the Strait of Gibraltar, the coast-line, though well defined, is low, sandy, and occasionally swampy. From Gibraltar to Cape Palos the shores, which are backed in part by the mountain-range of the Sierra Nevada, are rocky and high (though flats occur at intervals), are unbroken by indentations, and comprise only two harbours, those of Cartagena and Malaga. A low, and for the most part sandy, coast extends north from Cape Palos, rising into rocky cliffs and bluffs in the vicinity of Denia, but extending in sandy flats from Denia to the mouth of the Ebro. From the mouth of this river, north to the frontier of France, the coast is alternately high and low, and its principal harbours are Barcelona and Rosas.

Surface and Hydrography.—The compactness and the isolation of this country, and its position between two seas, the most famous, and commercially the most important in the world, are not more in its favour than the character of its surface, which is more diversified than that of any other country in Europe of equal extent. An immense plateau, the loftiest in the continent, occupies the central regions of S., and is bounded on the N. and W. by mountainous tracts, and on the N.-E. by the valley of the Ebro; on the E. by tracts of land frequently low, but in some parts traversed by hill-ranges; on the S. by the valley of the Guadalquivir, which intervenes between it and the Sierra Nevada (q. v.). This great plateau rises to the height of from 2000 to 3000 feet, and occupies upwards of 90,000 sq. m., or about half of the entire area of the country. The whole of the Pyrenean peninsula is divided by Spanish geographers into seven mountain ranges, of which the chief are: 1. The Cantabrian Mountains (q. v.), and the Pyrenees (q. v.), forming the most northern range; 2. The Sierra de Guadarrama, separating Leon and Old Castile from Estremadura and New Castile, and rising in the peak of Penalara 7764 feet above sea-level; 3. The Montes de Toledo, forming a part of the watershed between the Tagus and the Guadiana; 4. The Sierra Morena (q. v.), between the upper waters of the Guadiana and Guadalquivir; 5. The Sierra Nevada (q. v.), running parallel with the shores of the Mediterranean, through southern Murcia and Andalucia, and rising in its chief summits to loftier elevations than are found in any mountain-system of Europe, except that of the Alps. The several mountain-ridges, or as they are called, *Cordilleras* of S., have a general east and west direction, and between them run, in the same direction, the nearly parallel valleys or basins of the great rivers of the country, the Douro, Tagus, Guadiana, and Guadalquivir, each of which is described in its proper place.

Climate and Soil.—The climate of S., owing to the extent and configuration of the country, is exceedingly various. In the north-west (maritime) provinces, it is damp and rainy during the greater part of the year; at Madrid, which is situated about 11° south of London, and only 5° north of the shores of Africa, winters have occurred of such severity, that sentinels, while on duty, have been frozen to death; while the south and east provinces are warm in winter, and are exposed to burning winds from the south, and to an almost tropical heat in summer. Both ancient and modern geographers have adopted difference of climate as the rule for dividing the Peninsula into tracts distinct as well in soil and vegetation as in temperature. Of these tracts or zones the first and most northern may be considered as embracing Galicia, Asturias, the Basque Provinces, Navarre, Catalonia, and the northern districts of Old Castile and Aragon. In this tract, the winters are long, and the springs and autumns rainy, while north and north-east winds blow cold from the snow-covered Pyrenees. The country, which alternates with hill and dale, is plentifully watered by streams rich in fish, and meadows yielding rich pasturage abound. Corn scarcely ripens in the more exposed districts, but grain crops of all kinds are produced in others, as well as cider, wine, and valuable timber. The middle zone is formed mainly by the great central plateau, and embraces Northern Valencia, New Castile, Leon, and Estremadura, with the south parts of Old Castile and Aragon. The climate of the great part of this region is pleasant only in spring and autumn. Throughout the chilly winter, the treeless table-lands are over-swept by violent tempests, and in summer are burned up by the sun. The soil is generally fertile, and corn and wine are most abundantly produced. The southern or Bætican zone, comprising the rich country that extends between the southern wall of the central plateau and the Mediterranean shores, includes Andalucia, Murcia, and Southern Valencia. The stony rampart on the north protects it from the chilly winds of the central zone; but it is unprotected against the hot winds (the Solana, see SIMOOM) which in summer blow north from Africa, and render this season intolerable to northern Europeans. Here the winter is temperate, and the spring and autumn delightful beyond description. The descent from the cold and mountainous central regions to this tract of tropical heat and fertility affords a most striking contrast. The soil, which is artificially irrigated, is well adapted to agriculture and the cultivation of heat-loving fruits. The products comprise sugar, cotton, and rice, and the orange, lemon, and date.

Material Revival of Spain; Productions, Vegetable and Mineral.—Owing to a number of causes, S., at one time the most opulent kingdom in Europe, had, in the 18th c., lapsed into a state of complete stagnation; the spirit of enterprise seemed extinct, and ease and squalor to be preferred to labour and affluence. Before the commencement of the present century, however, the country began to throw off its lethargy, and since that time the rate at which it has been advancing toward a healthy condition of active life has become gradually accelerated. Since 1851, the onward movement of the nation has been as rapid as that of any of the great European powers. The population has greatly increased, and is increasing; agriculture, previously stagnant, is now carried on with activity and success; manufactures are multiplying rapidly; and railways, of which, in the beginning of 1848, not a mile had been constructed, are now in process of being laid out between all the great centres of population—2902 miles were in operation in 1865. A view of the increase of the population, the first basis of power, will afford an index of the growing prosperity of the country. The estimates of the population of S. for various periods between the beginning of the 16th c. and the middle of the 18th c. vary considerably; but it is certain that there was a gradual decrease of from 2,000,000 to 3,000,000 of

inhabitants between the years 1500 and 1700. With regard to later times, we have the following authentic statement:

Year.	Population.
1768,	9,159,999
1797,	10,541,221
1857,	15,464,340
1860,	15,673,536
1870,	16,835,506

It thus appears, that in about a century, the population of S. has increased over 7,000,000. Comparing the census of May 1857 with that of December 1870, we find that the provinces in which the population has most largely increased are Madrid, Barcelona, Pontevedra, Seville, Cadiz, Valencia, Alicante, Oviedo, Zaragoza, Jaen, and Guadalajara. These are for the most part maritime provinces, or such as, from their vicinity to the coast, have facilities for communication with the sea; and, this being the case, it may be fairly argued that the rapid extension of the railway system now going on will—besides acting favourably on the whole kingdom—have a specially beneficial effect upon the interior provinces. In agriculture, as well as in population, the onward movement has been remarkable. The vast mountains of the country affording for the most part only scanty crops of herbage, are utilised as pasture-grounds, and are divided into large farms. But in the warm and fertile plains, especially in localities where water is abundant, the farms are small. The number of farms in 1800 is stated to have been 677,520, of which proprietors occupied 273,760, and tenants 403,760 farms. In 1860, there were 3,426,083 farms of all sizes, of which 750,000 were occupied by tenants, and the others by proprietors. Owing to their great number, the farms must of necessity be small; but it has been ascertained that the provinces in which the property is most subdivided are the wealthiest. The figures show that the subdivision of the soil must have been in a great measure the work of recent years; and yet nearly 46 per cent. of the whole land is uncultivated. The average quantity of wine produced annually in the three years 1860—1862 inclusive, was over 134,612,000 gallons, or twice the quantity produced in 1847. In the years 1860—1862, 28,573,336 gallons, on an average, were exported, 836,000 gallons were converted into brandy, and 105,202,724 gallons were consumed within the country. For the quantity exported, the sum realised, in 1869, was £2,348,714. In 1847, the quantity of wheat exported was 7,045,775 imperial bushels; the quantity exported in 1861 was 120,012,200 bushels. 948,024 gallons of olive oil were exported in 1850; in 1861, 2,492,688 gallons, realising £813,813. But the quantity *produced* in the country is (1875) about 5,000,000 gallons a year. The following table shews the value in reals (1 real = $2\frac{1}{2}d.$) of certain of the agricultural products exported from S. to foreign countries in recent years:

Years.	Green Fruit.	Dried Fruit.	Grain, Vegetables, and Seeds.	Cork.	Saffron.	Spanish Grass.
1850,	3,958,756	87,579,143	12,354,554	18,651,265	3,227,620	2,898,490
1851—1855,	6,017,039	52,784,016	93,513,653	16,610,706	5,884,929	2,285,616
1856—1860,	18,501,517	100,523,560	42,340,691	32,405,274	7,324.758	2,276.224
1861,	19,507,531	88,828,195	61,297,818	38,496.644	8,995,000	3.445,090
1862,	47,005,919	95,997,535	30,363,377	33,450,174	18,060,090	6,929,600

The following table shews the number of cattle of different kinds, with their value in reals, according to latest returns:

Kinds of Cattle, &c.	Number of Cattle.	Value in Reals.
Black cattle,	1,869,148	884,398,948
Horses,	382.009	276,656,041
Mules,	665,472	770,983,276
Asses,	750,007	177,398,066
Sheep { Fixed in one locality,	14,341,181	525,436,366
Sheep { Migratory,	5,251,357	119,711,760
Goats,	3,145,100	132,499,239
Swine,	1,608,203	255,899.241
Camels,	1,861	2,091,970

Spanish statistics of all kinds are very imperfect; but judging from the imports of coal and iron, the manufacturing industry of the country is rapidly advancing in spite of all drawbacks. The imports of coal had risen from 75,276 tons in 1849 to 514,052 tons in 1866; besides about 316,027 (in 1863) extracted from native mines. The average quantity of iron annually imported from 1856—1860, was 11,785 tons, but in 1862, nearly double the amount was imported, in 1864, 63,335 tons, and in 1866 but 18,999 tons wrought and unwrought. The cotton manufactures of S. have been advancing with remarkable rapidity. In 1849, 233,898 cwts. of cotton were imported. This quantity increased annually until, in 1863, the quantity imported was 798,299 cwts.

Commerce, Exports, and Imports.—In 1872, the mercantile marine of S. consisted of 4326 vessels (about 100 of which were steamers), of 359,765 tons; showing a decrease of 2389 vessels and 89,671 tons from the year 1860 to 1872. In 1857, 11,024 vessels entered and cleared the ports; in 1867, the entrances and clearances numbered 17,900. The value of the foreign commerce of S. was in 1863, £27,900,000, in 1867, £21,835,000. The countries with which S. trades most extensively are France, Great Britain, Cuba, the British Possessions, and the United States, and of these countries Great Britain receives about as much as France, while the latter (owing probably to the vicinity of that country) supplies more of the imports of S. than any other state. The foreign trade of the country is carried on most extensively at the following ports, which are set down in the order of their importance: Barcelona, Cadiz, Santander, Alicante, Malaga, Valencia, Bilbao, Cartagena, San Sebastian, Elizondo, and Irun. The principal articles imported are—in the order of their importance—sugar, yarn, woollen fabrics, raw cotton, iron, machinery, coals, and dried fish; the chief articles exported are wine, metals, dried fruit, flour, bullion, green fruits, olive oil, minerals, wool, grain, cork, rags and esparto cork and salt. In the year ending December 31, 1869, produce amounting in value to £6,346,741 was imported from S. into Great Britain. Compared with the total of 1865, an increase is manifest of £1,577,464, and with that of 1868, a decrease of £244,280, wine exceeding half the entire annual aggregate in value. Almonds, grapes, nuts, oranges, lemons, and raisins are also exported in immense quantities, the value of which varies from £500,000 to £1,000,000 annually. The total imports of S. in 1869 amounted to £16,000,000; the exports in the same year, to nearly £12,000,000. Lead, quicksilver, iron pyrites, silver ore, manganese ore, copper and copper ore, figure largely in the returns for 1864. The number of Spanish vessels that entered the ports of the United Kingdom in 1864 was 319, of 106,140 tons

The exports from Cuba for the first six months of 1870 were 1,154,962 boxes, 465,684 hhds. of sugar, and 292,926 hhds. of molasses.

Railways and Roads.—In October 1848, the first Spanish railway, 18 miles in length, from Barcelona to Mataro, was thrown open to the public, and before the close of 1873, 3310 miles of railway were open for traffic, and about 1200 miles were in course of construction. The capital employed in their construction to the date of Jan. 1, 1867, was £74,689,113. In 1865, the net produce of the traffic was £2,927,450. In 1870, 74,884,999 letters were carried through the post, the destination of 69,841,785 of which was at home, 2,923,549 to the Spanish colonies, and 2,119,665 to foreign countries. The length of the telegraph lines in 1871 was 11,754 kilometres (about 7300 miles).

Army.—The army mustered (1873), according to the *Almanach de Gotha*, 216,000, of which 80,000 were in active service and 136,000 in reserve. Of the former 60,000 were infantry, 9000 cavalry, 8500 artillery, and 2500 engineers.

Navy.—The navy in 1874 consisted of 202 vessels, carrying 894 guns, as follows:

1*st Class.*—7 iron-clad frigates (145 guns); 10 screw-frigates (431 guns); 3 paddle-steamers (48 guns).

2*d Class.*—10 paddle-steamers (48 guns); 9 screw-steamers (30 guns); 2 transports.

3*d Class.*—20 screw-steamers (45 guns); 54 gunboats (54 guns); 10 paddle-steamers (20 guns); 73 brigs (73 guns); 4 screw-transports.

Unclassified.—5 steamers (5 guns); 1 monitor (3 guns); 2 despatch-boats (6 guns); 1 floating battery, 1 transport.

Revenue and Expenditure.—The annual revenue of S., estimating according to the budget of 1870—1871 as a basis, is £21,428,082, and the expenses are £28,-666,694, showing a deficit of £7,238,614. The public debt, according to the statement of the minister of finance, amounted in May 1873 to 7,830,150,000 pesetas = £326,256,250, or about $1,587,726,000. The floating debt was stated to be 643,700,000 pesetas = £26,820,833, or about $130,523,500.

Education.—In 1861, there were 22,060 schools, attended by 1,046,558 scholars; in 1868, the number of scholars had risen to 1,251,653. There are ten universities in S., in Madrid, Barcelona, Granada, Oviedo, Salamanca, Seville, Santiago, Valencia, Valladolid, and Zaragoza, with 58 colleges, attended by 13,881 pupils.

History.—S., the *Spania*, *Hispania*, and *Iberia* of the Greeks, and known to the Romans by the same names, was inhabited at the period at which it first receives historical mention, by a people deriving their origin from different races. It is supposed to have been originally inhabited by a distinct race called Iberians; upon whom, however, a host of Celts are supposed to have descended from the Pyrenees. In the earliest times of which we have any record, these two races had already coalesced and formed the mixed nation of the Celtiberians, who were massed chiefly in the centre of the peninsula, in the western districts of Lusitania, and on the north coasts. In the Pyrenees and along the east coast, were to be found pure Iberian tribes, while unmixed Celtic tribes occupied the north-west. In Bætica (Andalucia) there was a large admixture of the Phœnician element, and on the south and east coasts, numerous Phœnician, Carthaginian, Rhodian, and other colonies. A portion of the south coast, called Tartessus by the Greeks, the Tarshish of Scripture, was much frequented for its mineral riches by the Phœnician merchantmen, and the 'ships of Tarshish' were as distinct a section of the Tyrian mercantile marine, as were the Spanish galleons of the 16th c., or our own Indiamen of more recent times. But the bond which connected the Iberians and the Phœnicians was purely of a commercial character. About the middle of the 3d c. B.C., the Carthaginian influence began to be much felt in Iberia, and a considerable tract of territory was brought under subjection to Carthage by Hamilcar (q. v.), who founded the city of Barcelona. During the next eight years, the Carthaginian interest was advanced, and its power further strengthened by Hasdrubal (q. v. — died 220 B.C.), son-in-law of Hamilcar, who founded Carthago Nova (the modern Cartagena), and concluded a treaty with the Romans whereby it was stipulated that he should not advance his standards north of the Iberus (Ebro). Hannibal (q. v.), son of Hamilcar, and the greatest of all the Carthaginian generals, now assumed the command in the peninsula. He attacked and destroyed Saguntum (q. v.), and thus violated the treaty made between his father and the Romans. The destruction of Saguntum was the cause of the Second Punic War, for the principal incidents of which see CARTHAGE, ROME, HANNIBAL, and the SCIPIOS. After the Romans had driven the Carthaginians from the peninsula in 206 B. C., the country was erected into a Roman province, consisting of two political divisions—*Hispania Citerior* (Hither S.) including the eastern and northern districts, or those nearest to the centre of the Roman Empire; and *Hispania Ulterior* (Further S.) including the districts furthest from Rome, or the southern and western districts. It was not, however, till 25 B.C. that the Cantabri and Astures in the extreme north of the country, laid down their arms to Augustus. After the country had been reduced to subjection, it was divided into the three provinces of Tarraconensis (embracing the northern and eastern provinces), Bætica (Andalucia), and Lusitania (Portugal and certain of the western provinces). This division of the country lasted till the reign of Constantine the Great (q. v.), (306—337). From the time of the complete supremacy of the Romans till the death of Constantine, the condition of S. was eminently prosperous. The inhabitants, when brought under the iron rule of the empire, were forced for the time to desist from the intestine wars in which it had been their habit to indulge, and adopting the language, laws, and manners of their conquerors, they devoted themselves to industrial pursuits, and increased remarkably both in wealth and in numbers. Everywhere throughout the country, towns of a purely Roman character sprang up, among the chief of which were Leon, Emerita Augusta (Merida), Pax Julia (Beja), Cæsar Augusta (Zaragoza); and numerous aqueducts, bridges, amphitheatres, &c., were built, the ruins of which are the wonder of the modern traveller. S., though obtained at enormous cost both in treasure and in human life, was for three centuries the richest province of the Roman Empire. Its fertile fields formed for a considerable time the granary of Rome, and from its metal-veined sierras, an immense amount of treasure in gold, silver, &c., flowed into the Roman coffers. 'Twenty thousand pound-weight of gold,' says Gibbon, 'was annually received from the provinces of Austria (Asturias), Galicia, and Lusitania.' This amount of wealth was not the voluntary offering of the natives, who were compelled to labour in their mines for the benefit of strangers; and thus S., in the early ages, was the type of Spanish America in the 15th and succeeding centuries, with the single difference that in the first case the Spaniards were the slaves, and in the second they were the slaveholders. In 409 A. D., hordes of barbarians, Alans, Vandals, and Suevi, crossed the Pyrenees and swept over and desolated the peninsula—the Vandals for the most part settling in Bætica, the Alans

in Lusitania, and the Suevi in Leon and Castile. About 412, the Visigoths invaded the country, and their king, Athaulf, who acknowledged a nominal dependence on the Roman emperor, established the Gothic monarchy in Catalonia. See GOTHS. Of the Visigoths—by whom the Suevi were subjugated (584), the Vandals and Alans expelled (427) from the country, and large portions of Gaul annexed to their Spanish dominion—the most remarkable kings were Wallia (415—418), who greatly extended the Gothic monarchy; Euric (466—483), who, besides increasing his territory, introduced and enforced a body of laws, and did much for the advancement of civilisation in S.; Wamba (673—680), who built a fleet for the protection of the coasts; and Roderic (q. v.), who was killed at Xeres de la Frontera in 711, in battle with the Moors. The battle of Xeres gave the Moors almost undisputed mastery of nearly the whole of S., as well as of the outlying Gothic province of Septimania (Languedoc) in France; for the remnant of the Goths betook themselves to the highlands of Asturias, Burgos, and Biscay, where, in a region which throughout had enjoyed more liberty than any other part of S., they maintained their independence.

Dynasty of the Moors.—The Arabs, or, as they are more properly termed, the Moors (q. v.), held S. for the first few years of their rule, as a dependency of the province of North Africa; but, after the downfall of Muza (q. v.), and his son Abd-el-aziz, who had been the deputy-governor of Spain, the country was governed (717) by *emirs* appointed by the calif of Damascus. The favourite scheme pursued by the Spanish emirs was the extension of their conquests into Gaul, to the neglect of the rising power of the Goths in Asturias; they also took the Balearic Islands, Sardinia, Corsica, and part of Apulia and Calabria; the Mediterranean was infested by their fleets, but their northward progress was most signally checked on the plain of Tours by Charles Martel (q. v.). Anarchy and bloodshed were prominent features of the first 40 years of Mohammedan rule in Spain. The *walis*, or local governors of districts and provinces, frequently rebelled against the emir, and drew sword against each other according as ambition or animosity dictated. Within this period of 40 years, no fewer than 20 emirs had been called to the direction of affairs; but a revolution at Damascus, which unseated the Ommiades, and placed the Abbasides in possession of the califate, put an end to this state of misrule in S. The last of the *emirs*, Jussuf, was in favour of the Abbasides, but the *walis* and *alcaydes* being chiefly of the Ommiade faction, invited one of this family, who was in concealment among the Zeneta Arabs in Barbary, to become an independent calif in Spain. See OMMIADES. Thus was founded the *califate of Cordova*, from which, in 778, the Franks wrested all its possessions north of the Pyrenees, and North-eastern S. to the Ebro; the latter acquisition, subsequently denominated the *Spanish March*, being alternately in the hands of the Moors and dependent upon France.

Christian Kingdoms.—During this period of Moorish domination, the small independent kingdom of Asturias, founded by Pelayo (q. v.), had been growing in power and extent. It was increased by Galicia in 758, and by parts of Leon and Castile towards the close of the century. In 758, a second independent Christian kingdom was founded in Sobrarve, and increased by portions of Navarre on one hand and Aragon on the other, but though it, along with the French Gascons, aided the Moors at Roncesvalles (q. v.), it was, in 801, again swallowed up by the califate of Cordova. However, 36 years afterwards a Navarrese count, casting off his allegiance to France, founded the third Christian kingdom, that of Navarre (q. v.), which from this time easily maintained itself, owing to its situation, in independence of the Moors. The kingdom of Asturias, now (900) Leon, was for a long time distracted by bitter and bloody strife among the members of the royal line, and with its neighbour Navarre would have fallen an easy prey to the powerful Ommiades, had not the latter directed their chief attention to the subjugation of Morocco; and under cover of this relaxation of the constant warfare between Moors and Christians, another independent monarchy, an offshoot from Leon, was founded in Castile (933, kingdom in 1035), which, from its central position, and consequent greater facilities for expansion, soon became the most powerful of the Spanish states, especially after its union (temporary, 1072—1157), in 1230, with Leon. A considerable part of Aragon had been wrested from the Moors by Sancho III. (1000—1035) of Navarre, and at his death this part of his dominions passed by inheritance to his son Ramiro, who added to it the districts of Sobrarve and Ribagorza, and a considerable extent of country which he conquered from the common enemy, the Moors. This kingdom of Aragon was the last Christian kingdom formed in S.; and though it increased by acquisitions from the Moors, yet being limited by Leon, Castile, and Navarre on one side, and the Spanish March (now only the county of Catalonia or Barcelona) on the other, its princes aimed at maritime power; and by the union, through the marriage of the Count of Barcelona with Queen Petronilla, of the Spanish March with Aragon, means were obtained of carrying out this policy, and the spread of the Aragonese dominion to Sicily (q. v.), Naples (q. v.), and other regions bordering on the Mediterranean, was the consequence. These three kingdoms—Castile and Leon, Navarre, and Aragon—continued, sometimes in combination and sometimes separately, to war against their common enemy, the Moors—Castile being, from its greater power and proximity, the most persistent assailant, and Navarre, for the opposite reason, the least so; but whenever the arrival of fresh levies from Africa, or the accession of an energetic calif threatened serious danger to any one of the three, the others generally came to its aid.

The extinction of the Ommiades in Spain in 1031, and the disruption of the califate into the minor kingdoms of Cordova, Seville, Toledo, Lisbon, Zaragoza, Tortosa, Valencia, Murcia, Badajos, and seven others of less note, was an occurrence by which the kings of Castile and Aragon did not fail to benefit, for by well-directed and unremitting attacks they subdued some, rendered others tributary, the kings of Portugal also on their side gallantly and successfully pursuing the same policy; and a few years more would have certainly annihilated Moorish domination in S., had not Mohammed of Cordova and Seville, hard pressed by Alfonso VI. of Leon and Castile about the close of the 11th c., applied for aid to an Arab tribe, whose military career in North Africa had been of the most brilliant character. This tribe, the Almoravides—i. e., men devoted to the service of God—had made themselves masters of the provinces of Africa and Almagreb, and founded the empire of Morocco. Responding to the request of Mohammed, the Almoravides crossed over to S., defeated the king of Aragon and Castile, and recovered much of New Castile. Then, turning upon their ally Mohammed, they compelled him to yield up the provinces of Cordova and Seville, and all the minor Moorish princes to follow his example; so that, in 1094, the Almoravide sovereign was acknowledged sole

monarch of Mohammedan Spain. The power of this tribe, however, began to decline about 1130, and was extinguished by the Almohades (q. v.), a fanatical sect of Mohammedans, who landed in S. in the middle of the 12th c., and conquered the territories of the Mohammedans in Spain. During the reign of the third monarch of this dynasty took place the battle between the combined forces of Castile, Leon, Navarre, Aragon, and Portugal, with the Moors, in which the former gained the most celebrated victory ever obtained by the Christians over their Moslem foes, the latter losing, according to the account transmitted to the pope, 100,000 killed and 50,000 prisoners. This sanguinary conflict, fought on the plains of Tolosa (*las navas de Tolosa*), 16th July 1212, broke the Almohade power in Spain, as that of Salamanca (22d July 1812), almost exactly six centuries afterwards, did the more formidable strength of Napoleon. On the fall of the Almohades, Mohammed-ben-Alhamar, the king of Jaen, rose to the first place among the Mohammedan princes, and founded (1238) the *kingdom of Granada*. The king of Granada was speedily forced to become a vassal of Castile, and from this period all danger from Moslem power was over. The rest of the history of the Spanish kingdoms before their union is undeserving of a detailed account. The Castilian court was the scene of almost constant domestic strifes and rebellions, varied with a campaign against Granada or in favour of the monarch of that kingdom against his rebellious vassals; the only prominent monarchs of this kingdom being Ferdinand III., who confined the Moorish dominion to the south of Andalucia, Alfonso X. (q. v.), Alfonso XI., Pedro the Cruel (q. v.), and Queen Isabella, the last sovereign of Castile, who succeeded her brother Henry IV., owing to a wide-spread belief in the illegitimacy of the latter's daughter. Aragon, on the other hand, was almost wholly free from intestine dissensions, doubtless owing to the interest taken by the Aragonese monarchs in Italian politics; of these sovereigns Jayme I. (1213—1248) conquered Valencia and Majorca, and, first of all the Aragonese kings, received a voluntary oath of allegiance from his subjects; Pedro III. (1248—1285), who obtained Sicily (1282), Minorca, and Iviza; Jayme II., who conquered Sardinia and Corsica; Alfonso V. (1416—1468), who conquered Naples; and Ferdinand II. (q. v.), the Catholic, the last sovereign of Aragon, who, by marriage with Isabella, Queen of Castile, in 1469, the conquest of Granada in 1492, and that of Navarre in 1512, united the whole of Spain (and French Navarre) under one rule.

The year 1492, in the reign of Ferdinand and Isabella, witnessed also the discovery of America, as well as the capture of Granada. S. had now become consolidated into one empire, from the Pyrenees to the Strait of Gibraltar; civil wars were at an end; and a splendid continent, teeming with riches, had been opened up for Spanish adventure and enterprise. But, as the most active spirits among the Spaniards now crowded to the New World, the soil of S., and its mineral treasures, both inexhaustible sources of wealth, were neglected for the riches of the fancied El Dorado, where, as was everywhere believed, gold was more plentiful than iron was in the old country. Besides the drain upon the country from emigration, the expulsion of the Jews and Moors was productive of the direst results; and the decline of the splendid Spanish Empire, upon which the sun even then never set, may be said to have had its origin in the event which raised the country to the height of its magnificence. Charles I. (Charles V. of Germany, q. v.) succeeded Ferdinand, and in his reign Mexico (q. v.) and Peru (q. v.) were added to the possessions of Spain. Philip II. (q. v.), by his enormous war expenditure and mal-administration, laid a sure foundation for the decline of the country. Industry, commerce, and agriculture may be said to have been extinguished at the expulsion of the Moriscoes (see MOORS); and the reigns of Philip III. and Philip IV. witnessed a fearful acceleration in the decline of S. by the contests with the Dutch, and with the German Protestants in the Thirty Years' War, the intermeddling of Olivarez (q. v.) in the affairs of Northern Italy, the rebellion of the Catalans, whom the minister wished to deprive of their liberties, the wars with France, and the rebellion of Portugal (1640), which had been united to S. by Philip II. That of Charles II. was still more unfortunate, and the death of the latter was the occasion of the War of the Spanish Succession (see SUCCESSION, WAR OF). Philip V. (q. v.) was the first of the Bourbon dynasty who occupied the throne of Spain. Under Charles III. (1759—1788), a wise and enlightened prince, the second great revival of the country commenced; and trade and commerce began to shew signs of returning activity. During the inglorious reign of Charles IV. (1788—1808) who left the management of affairs in the hands of the incapable Godoy (see ALCUDIA), a war (1796—1802) broke out with Britain, which was productive of nothing but disaster to the Spaniards, and by the pressure of the French another arose in 1804, and was attended with similar ill success. Charles abdicated in favour of his eldest son, the Prince of Asturias, who ascended the throne as Ferdinand VII. Forced by Napoleon to resign all claims to the Spanish crown, Ferdinand became a prisoner of the French in the year of his accession, and in the same year Joseph, the brother of the French emperor, was declared king of S. and the Indies, and set out for Madrid, to assume the kingdom thus assigned to him. But before this time, an armed resistance had been organised throughout the whole country. The various provinces elected juntas or councils, consisting of the most influential inhabitants of the respective neighbourhoods, and it was the business of these juntas to administer the government, raise troops, appoint officers, &c. The supreme junta, that of Seville, declared war against Napoleon and France on the 6th of June 1808. In July, England, on solicitation, made peace with S., recognised Ferdinand VII. as king, and sent an army to aid the Spanish insurrection. Joseph, on July 9, entered S., defeated (through his lieutenant Bessières) the Spaniards at Rio Seco, and entered Madrid on the 20th; but the defeat of Dupont at Baylen by the veteran Spanish general Castaños, somewhat altered the position of affairs, and Joseph, after a residence of ten days in his capital, was compelled to evacuate it, and retire north to Vitoria. The noble defence by Palafox of the city of Zaragoza against Lefebvre, and the return of the Marquis de la Romana with 7000 regular troops who had been wiled from the country by Napoleon, did much to inspirit the patriots. On the 12th July 1808, Sir Arthur Wellesley, afterwards Duke of Wellington (q. v.), at the head of the British auxiliary force, landed (5th August) at Mondego Bay, and began the Peninsular War by defeating the French at Roliza and Vimiero (q. v.); but in spite of his opposition, the Convention of Cintra was signed, and the French transported to their own country. In November 1808, Napoleon, who had been preceded by Ney (q. v.) with 100,000 men, entered S., and at once assumed the command. For a time his armies were completely successful; Soult utterly routed the Spanish general Belvedere, 10th November, and annihilated Blake at Reynosa on the 13th. Castaños and Palafox were routed at Tudela by Lannes, and in the

beginning of December, Napoleon entered Madrid. At this time, the British forces were under the command of Sir John Moore (q. v.), who, aware of his great inferiority in numbers and resources, retreated west from Salamanca, whither he had come to assume the command of the allied forces, and reached Coruña (q. v.) on the 11th January 1809. On the 22d April, General Wellesley arrived in Portugal, and, at once commencing operations, drove Soult from Oporto, and took possession of Portugal; then, favoured by the disunity of action which subsisted between the three or four French armies who held S., he directed his attacks upon the army of the centre, retreating when any of the others came to its aid, and by dint of masterly generalship and bold enterprise, succeeded, after four campaigns, in driving the French from the country. To this result, the co-operation of the Portuguese and of the Spanish *guerrillas*, the revengeful hatred of the peasantry towards their tyrannical oppressors, and the drafts from the Spanish armies so frequently made by Napoleon for his wars in Central Europe, largely contributed. See WELLINGTON, SOULT, VICTOR, &c. Napoleon, loath to lose his hold of the Peninsula, sent Soult, his most trusted general, to stop the ingress of the British into France; but the battles of the Pyrenees (24th July—1st August 1813), and of the Nivelle, Orthez, and Toulouse, in the beginning of 1814, brought to a victorious conclusion this long and obstinate contest.

In 1812, a constitution, on the whole liberal, had been devised for the country by the Cortes of Cadiz. It was abrogated, however, by Ferdinand VII. (q. v.), who treated the subjects who had shewn such devoted loyalty to him with infamous ingratitude, and obtained the aid of France to establish despotism. The reign of his daughter, Isabella II. was disturbed by the Carlist rebellion in 1834—1839, in which the British aided the queen with an army under Sir De Lacy Evans. See CARLOS. The next events of importance were the contest between Espartero (q. v.), the regent, and the Queen-dowager Christina, for the supreme power during the minority of the queen; Espartero's flight before O'Donnell and Narvaez (1843); his restoration in 1847; banishment of Queen Christina (1854); formation of the O'Donnell ministry (1858;) war with Morocco (q. v.), and annexation of St Domingo (1861),—acknowledged independent in 1865; war with Peru and Chili (1864–65), and permanent truce in 1871; insurrection under General Prim (1867), soon suppressed; flight of Queen Isabella (Sept. 1868), and eventual abdication, and formation of a provisional government, with Serrano as President and Prim minister of war. Protestant worship was permitted (Jan. 1869), and Bibles admitted April the same year. On the 10th of June 1869, a constitution was adopted providing for a senate and congress and a monarchical form of government. After much search for a king, the choice fell upon the Duke of Aosta, second son of Victor Emanuel, and he was declared sovereign on November 16, 1870, under the title of Amadeo I. He was succeeded by Alfonso XII. (son of Queen Isabella), who was proclaimed king December 31, 1874. The present constitution was adopted in 1876, and provides that Spain shall be a constitutional monarchy.

SPALA'TO (often erroneously called SPALATRO; in Illyric, SPLIT), an important seaport of Dalmatia, empire of Austria, is finely situated on a promontory projecting into one of those numerous bays that mark the eastern coast of the Adriatic. It originated in the famous palace of Diocletian, built in the 3d century. As this immense structure (which occupied twelve years in building) stood not far from the city of Salonæ, the great bulwark of Roman power in Dalmatia, it was called *Salonæ Palatium*, briefly written *S. Palatium*. When Salonæ was conquered by the Avars in the 7th c., the inhabitants fled for refuge to the fortress-palace of the emperor, where they laid the foundations of a new town, corruptly named *Aspalathum*, whence the modern *Spalato*. Even yet, more than one-half of the town is compressed within the limits of the ancient palace, a considerable portion of whose walls still remain. The best-preserved parts of the palace are the temple of Jupiter, transformed in the 7th c. into a Christian cathedral, and the temple of Æsculapius, which is now a Baptistery dedicated to St John. Modern S. is divided into an old and new town; the former consisting mainly of narrow, crooked, and dirty lanes; the latter more agreeable and open. It is the seat of a bishop, has a chamber of commerce and manufactures, and is the principal emporium for goods passing from Italy overland into Turkey. Pop. 15,784.

SPA'LAX. See MOLE-RAT.

SPA'LDING, an important market-town and river-port in Lincolnshire, in a rich agricultural district, on the Welland, 8 miles from its mouth in the Wash. Considerable trade is carried on by the Welland, and vessels of 100 tons are able to reach the town. The grammar-school, founded in 1568, has £174 a year from endowment. An important stock and corn market is held every Tuesday. S. was a place of consequence as early as the Saxon times, and contained a Benedictine monastery. Pop. (1881) 9260.

SPALLANZANI, LAZARO, a celebrated anatomist and naturalist, was born at Scandiano, in Modena, Italy, 12th January 1729. After a careful education, he took clerical orders; and in 1754, he was appointed to the chair of Logic, Metaphysics, and Greek at Reggio; but soon after this he obtained a chair at Modena, and refusing the tempting offers made him by the universities of Parma and Coimbra, and the Academy of St Petersburg, gave himself up to the study of natural history. His attention was directed to the doctrine of generation propounded by Needham and Buffon, which, after careful study and experiment, he overturned. He then turned his attention to the circulation of the blood, and was the first to follow its course through the intestinal tube, the liver, spleen, ventricles, pulmonary organs, &c.; 'established,' according to Senebier, 'the propulsive power of the heart over the blood in the various vessels, demonstrated that the heart never wholly empties itself, explained the various causes which retard the circulation, and the obstacles produced by the weight of the blood.' On the re-establishment of the university of Pavia, S. was appointed (1768) Professor of Natural History, and keeper of the museum, which he greatly enriched with fishes, crustacea, and testacea, the fruits of his numerous excursions. In 1785, refusing the chair of Natural History at Padua, which had been so admirably filled by Vallisnieri, he accepted the proposal of the Archduke Ferdinand to accompany, with doubled salary, the Austrian ambassador to Constantinople (22d August 1785); and during a residence of 11 months in Turkey, found ample materials for study and observation. In 1788, he visited Naples whilst Vesuvius was in eruption, the Lipari Isles, and Sicily, in restless prosecution of his scientific labours, and then retired to Pavia, where, refusing the tempting offers of the French Directory, he spent the remainder of his life, prosecuting his scientific researches amid bodily sufferings, and died of apoplexy, 12th February 1799. His works, many of the more valuable of which have been translated into English, are too

numerous to mention; but a complete catalogue of them, along with a biography, will be found in the *Biographie Médicale*, vol. vii. See also, for the result of his labours, the *Eloge*, by M. Alibert, in the *Mémoires de la Société Médicale d'Emulation*.

SPAN, a natural measure of length, being the distance between the tips of the thumb and middle finger, the hand being stretched as much as possible. This space averages about 9 inches, and the term came to denote a measure of 9 inches.

SPA'NCELLED, in Heraldry, a term applied to a horse two of whose legs are fettered by a log of wood.

SPA'NDAU, a town of Prussia, in the province of Brandenburg, is situated at the confluence of the Havel and Spree, 9 miles west-north-west of Berlin. S. is a fortress of the third rank; has a citadel (used as a state-prison) surrounded by water, with a garrison of 2000 men, and is a military dépôt. S. carries on manufactures of arms, gunpowder, woollens, &c., and has an active transit-trade as a station on the Berlin and Hamburg Railway. Pop. 17,306. It is one of the oldest towns in the Middle Mark of Brandenburg, and was long the residence of the Kurfürsts of the Hohenzollern House.

SPA'NDREL, the triangular space between the outside of an arch and a square head including it. This space is often filled with sculptured foliage, figures, &c.

SPA'NGLES, small circular pieces of very thin metal, usually silvered or gilded tin, pierced with a needle-hole, so that they can be sewed on to cloth. They are chiefly used for decorating theatrical dresses.

SPA'NIEL, a kind of dog, of which there are many breeds, differing considerably in size and other characters. None of the spaniels are large; some are amongst the smallest of dogs. Some are used for sporting purposes, others are merely kept as pets and companions. All of them are lively, playful, docile, and affectionate in a high degree. The S. is ever petitioning for regard, and shews boundless joy on receiving marks of kind attention. The ENGLISH S. is of an elegant but moderately stout form; with very large pendent ears, of which the hair is very long; the muzzle rather broad; the tail bushy; the body covered with long silky hair; the colours various, very often liver-coloured and white, or red and white. The name S. is said to indicate the introduction of this kind of dog into England from Spain. In the days of falconry, spaniels were much used for starting the game. The Cocker (q. v.), the Springer (q. v.), and the Blenheim Dog (q. v.) are nearly allied to the S., and are sometimes called by that name. The KING CHARLES'S S. is a beautiful black and white breed, almost as small as the Blenheim dog, and derives its name from Charles II., who took great delight in dogs of this kind. The WATER S. is one of the larger breeds. It has comparatively hard hair, and is distinguished by its readiness to pursue game by swimming. It is much used in decoy-ponds to drive ducks into the net.

SPANISH GRASS. See PAPER.

SPA'NISH LANGUAGE AND LITERATURE. The Spanish language is one of the Romanic tongues, and, like the others, originated in the *lingua Romana rustica*. See ROMANIC LANGUAGES. The earliest of the different Spanish dialects that assumed a literary form was the Castilian, which gradually became, and has continued to be, the classic dialect of the nation. It finely blends a certain soft, lingering richness of cadence, with an occasional sonorous majesty of expression, and on the whole may be considered one of the most beautiful of the European tongues. The course of Spanish conquest has also led to its establishment in Mexico, Central America, Cuba, Porto Rico, the greater part of South America, the Canary Isles and the Philippines. See the *Grammar and Dictionary* published by the Spanish Academy (1771), the grammars of Kiel (Leip. 1837), Fuchs (Berl. 1837), Wiggers, and Schele de Vere (New York, 1854). The best material for a historical grammar is furnished by Diez in his *Grammatik der Romanischen Sprachen*. The best Spanish dictionaries, besides that of the Academy, are Cabrera's (Mad. 1837), the Spanish-German by Seckendorff (3 vols., Hamb. 1823), and the Spanish-English of Neuman and Baretti (re-edited by Velazquez, New York, 1852).

Literature.—The literature of Spain may, in a superficial sense, be regarded as commencing under the auspices of the Romans, for Lucan, Seneca, and other eminent Latin authors were at least Spanish by birth; and, if we please, we may further look upon the Christian ecclesiastical writers of the Gothic period as the second link in the historical chain. But in the proper sense of the term, the literature of these two periods is no more *Spanish*—i. e., national—than an English book by an Anglo-Indian is to be held as a portion of Hindu literature, or the sermons preached by a missionary to South Sea Islanders are to be quoted as specimens of the literature of the Pacific. Passing over, then, the various developments of non-national literature in Spain—pagan Latin, ecclesiastical Latin, Arabic and Jewish—we come down to the 12th c., and then, for the first time after the gradual formation of a Spanish language, begin to notice the growth of something like a Spanish literature. Epic and didactic poems appear, written in Castilian verse, and full of strong national sentiment. The oldest of these is the *Poema del Cid* (see CID CAMPEADOR), of which only a single MS. exists. This MS. contains three other poems: *The Book of Apollonius, Prince of Tyre; The Life of Our Lady, St Mary of Egypt;* and *The Adoration of the Three Holy Kings*, the authorship of which (as of the *Poema del Cid*) is unknown. Other productions of this *first* period are the rhymed *Lives of the Saints*, by Gonzalo of Berceo (died about 1260); and the anonymous poem, *Count Fernan Gonzalez*, which, like the *Poema del Cid*, paints the earnest and picturesque struggle between the Moors and Spaniards. In all of these, we trace the influence either of the church or of the chivalric poetry of France; but they maintain, nevertheless, a distinctively national and independent character. A great impulse was given to the artistic development of Spanish literature by Alfonso the Wise of Castile (q. v.), who substituted Spanish for Latin in the courts of law, and fostered in many ways the growth of the national language. He is regarded as the founder of Spanish prose, his chief work in this department being the compilation of a series of codes, of which the most memorable is *Las Siete Partidas*, and a translation of the Bible into Spanish. Subsequent princes walked in his steps, and achieved an honourable reputation both as authors and patrons of literature, conspicuous among whom was the Infante Don Juan Manuel (died 1347), whose *El Conde Lucanor* (Count Lucanor) is a collection of 49 tales, apologues, &c., from oriental sources, and wearing an oriental aspect. The most remarkable Spanish poet of the 14th c. is Juan Ruiz, arch-priest of Hita (died 1351). His pieces, composed in a great variety of measures, number some 7000 verses, and include religious and love songs, fables, pastorals, &c. The didactic

tendency is particularly visible in the *Danza general de la Muerte* (Dance of Death).

The *second* period of Spanish literature embraces the later portion of the middle ages, and is marked by the presence of lyric poetry in considerable quantity, alongside of the didactic. It seems to have been inspired by the strains of the Provençal poets settled at the court of the Counts of Barcelona, and always continued to be more courtly than national. The most complete collection of this lyric poetry is the *Cancionero general* of Fernando del Castillo (Valencia, 1511; 10th edit., 1573), which contains the names of 136 authors, among which may be mentioned those of the Marquis of Villena, and the Marquis of Santillana, the three Manriques, Macias, Sanchez de Badajoz, Alonso de Cartagena, Diego de San Pedro, and Fernan Perez de Guzman. Against this court-poetry, however, a strong reaction took place, the national spirit reasserting itself vigorously in ballads, chronicles, romances of chivalry, and the drama. The best collection of the ballads (about 1000 in all) is to be found in the *Romancero general* (13 vols., 1605—1614); of the Chronicles (half-genuine, half-fabulous narratives of ancient Spanish heroes), the best are those of Ayala, of Juan Nuñez de Villaizan, the *Chronicle of the Cid*, and the *Chronicle of the Travels of Ruy Gonzalez de Clavijo;* of the romances of chivalry, the most celebrated is the *Amadis de Gaul*, parent of innumerable others (see AMADIS); and of the drama, among the first specimens are the pastoral plays of Juan de la Enzina, and the *Celestina* of Fernando de Rojas.

The *third* period, extending from the 16th to the 18th c., is the most splendid and productive in the annals of Spanish literature. Under Charles V., Spain became the foremost state in Europe, and the conquest of Naples brought it into close relation with the literature of Italy. The great Italian masters, such as Dante and Petrarch, began to be studied, and Italian measures and poetic forms to be imitated, although the rich, strong, Spanish spirit is never lost. The first of this new school was Juan Boscan Almogaver (died 1543), a brilliant sonneteer; other members of the same school are Garcilaso (q. v.) de la Vega, Diego Hurtado de Mendoza (q. v.), Francisco de Saa de Miranda, and Jorge de Montemayor (author of the once famous pastoral novel of *Diana*, see NOVELS), Fernando de Herrera (q. v.), and Luiz de Leon (died 1591), the last two of whom rank as the two greatest lyric poets that Spain ever produced. Gradually, a national drama established itself too. Conspicuous names in this department are Villalobos, Perez de Oliva, and Naharro (about 1517), sometimes regarded as the father of the Spanish drama. The last-mentioned wrote his comedies in the favourite national measure, the *redondillas*, and divided them into three acts. Besides these, we must mention Lope de Rueda, Juan de la Cueva, and Geronimo Bermudez, who cultivated tragedy with success. Among the most eminent prose writers of the first section of this third period was Geronimo Zurita, author of *Annales de la Corona de Aragon* (Annals of the Crown of Aragon, 6 vols.)—a somewhat critical work, shewing a decided advance on the credulous chronicles of the monks; Oliva, whose *Dialogo de la Dignidad del Hombre* (Dialogue on the Dignity of Man) is a fine specimen of elegant literature; and Morales, author of *Discursos* (Essays), relating to practical philosophy; &c.—Cervantes (q. v.) marks, if not exactly a new era, at least a splendid outburst of Spanish genius. It is unnecessary here to criticise the productions of his genius; we may only note, as it were, historically the fact, that his immortal *Don Quixote* put an end to the romances of chivalry —or rather to the extravagant imitations of these that sprung up after the age of chivalry had passed away. Lope de Vega (q. v.), a contemporary of Cervantes, and Calderon (q. v.), gave the national drama a European renown, and had, especially the latter, a host of followers more or less celebrated, among whom are Francisco de Rojas, Agustin Moreto, Fragoso, Diamante, Antonio Hurtado de Mendoza, Juan de la Hoz, Antonio de Solis, and Agustin de Salazar y Torres. The lyric and 'epic' poets of this period, which embraces the second half of the 16th, and the whole of the 17th c., are innumerable, but not great. The most notable names are those of the brothers Argensola, and Alonso de Ercilla y Zuñiga (author of *Araucana*, a fine poem on the conquest of Araucania in Chili by the Spaniards). A peculiar form of the novel also appeared, called the 'rogues' novel,' of which the only memorable specimen is the *Guzman de Alfarache* of Mateo Aleman; and even it derives not a little of its importance from the fact that it suggested Le Sage's *Gil Blas*. In history, the most distinguished names are those of Mariana (q. v.) and Solis.

The *fourth* period of Spanish literature extends from the accession of the Bourbons (1701) to the present time, and was long marked (like the contemporary literature of Germany) by a servile imitation of French models, and these by no means the best of their kind. This literary ascendency of France in the first half of the 18th c. over all civilised Europe is a very curious phenomenon, worthy of closer study than it has yet received. The most notable of the Frenchified Spaniards was Ignacio de Luzan, whose *Poetica* (1737) is a thoroughly Gallican performance. His efforts to denationalise the literature of Spain were combated by Garcia de la Huerto and others, and at length a sort of compromise was effected, and the 'Salamanca School' emerged into notice. Its founder, Melendez Valdez (born 1754), was a man of high genius, who subordinated his liberal culture to the sovereign control of a patriotic inspiration, and the same qualities are visible in its other members—Iglesias, Noroña, Quintana (q. v.), Cienfuegos, Arriaza, and Gallego. The great Peninsular War, and the subsequent political movements in Spain had a powerful effect in stirring up anew the elements of nationality, and the present century can shew a lengthened list of names both in prose and poetry. We can only afford space for a few: Tapia, Maury, Juan Bautista Alonso, Jacinto de Salas y Quiroga, Espronceda, Serafin Calderon, Zorrilla, Hartzenbusch, R. de Campoamer, Santos Lopez Pelegrin, Villergos, and G. Gomez de Avellaneda, in poetry; Saavedra, Mora, Zorrilla Gregorio Romero y Larrañaga, Manuel de Santa Ana, in romantic fiction; Leandro, Fernandez Moratin, in the drama; Ulloa, Muñoz, Capmany, Ferreras, Quintana, Navarrete, Clemencin, Torreno, and Maldonado, in history; Jovellanos, Arguelles, Miñano, Marina, Donoso Cortes, Martinez de la Rosa, &c., in political oratory.

Spain has not as yet achieved great results in any departments of science, either physical, mental, or moral; but of late years she has turned her attention seriously to scientific studies, and several admirable treatises in jurisprudence, political economy, medicine, philosophy, philology, and geography have been produced.—See Bouterwek's and Sismondi's *Histories of Spanish Literature;* and above all, Ticknor's work on the same subject, which has been translated into Spanish.

SPANISH MAIN. See SUPPLEMENT in Vol. X.

SPA'NISH TOWN, the seat of government of the British possession of Jamaica (q. v.), on the right bank of the Cobre, and 10 miles west of

Kingston. It contains several important public institutions, is ill-built and unhealthy, and contains about 6000 inhabitants.

SPA'NKER, a large quadrilateral sail, with parallel sides, set between the gaff and boom of a ship. Its foreleech is attached by rings to the mast. The spanker is a fore-and-aft sail of great importance in bringing the vessel to the wind.

SPAR (Ger. *Spath*), a term used by miners to denote any bright crystalline mineral, and which has been adopted by mineralogists in the names of a number of minerals, as calcareous spar, fluor spar, &c., in which, however, it has no proper generic significance.

SPA'RIDÆ, a family of acanthopterous fishes, having a general resemblance to the perch family —a single dorsal fin, which is not protected by any scales, and of which the anterior rays are spinous, the pectoral and ventral fins sharp-pointed, the tail-fin notched; the gill-cover shining, without proper spines or denticulations; the palate destitute of teeth; the scales large, broader than long, and generally thin. There are several sections of the family, distinguished by the teeth, which in some are all small and card-like, whilst others have trenchant, conical, and round molar teeth, variously arranged. The greater number inhabit the seas of the warm parts of the world; many species are found in the Mediterranean; a few on the coasts of Britain. Among the British species are the Gilthead (q. v.), and several species of different genera, known by the common name of Sea Bream (q. v.). The S. are generally good for food, and some are highly esteemed. Among them are the *Sargus* of the Mediterranean (*Sargus Rondeletii*), much valued by the ancient Romans, and the Sheep's Head (*Sargus ovis*) of the North American seas, which commands a very high price in the New York market.

SPARKS, JARED, American historian, was born at Willington, Connecticut, May 10, 1789; graduated at Harvard University in 1815; became tutor in mathematics and natural philosophy, and one of the conductors of the *North American Review.* In 1819, he was settled as a Unitarian minister at Baltimore, when he wrote *Letters on the Ministry, Ritual, and Doctrines of the Protestant Episcopal Church.* In 1821, he established a periodical called the *Unitarian Miscellany and Church Monitor*, in which he first published his *Letters on the Comparative Moral Tendencies of the Trinitarian and Unitarian Doctrines.* In 1823, he edited six volumes of essays and tracts on theological subjects, and, abandoning the pulpit, became for seven years sole editor of the *North American Review.* In 1828, he published a *Life of John Ledyard, the American Traveller;* and from 1834 to 1837, edited at Boston 12 octavo volumes of the *Writings of George Washington.* This important national work was followed by the *Diplomatic Correspondence of the American Revolution* (12 vols. 8vo, Bost. 1829—1830), and the *Life of Gouverneur Morris* (3 vols. 8vo, Bost. 1832). At this period, he commenced the *American Almanac of Useful Knowledge*, and began also his *Library of American Biography*, first issued in two series of 10 and 18 vols. 18mo. In 1840 was published his collection of the *Works of Benjamin Franklin* (10 vols. 8vo), after which he visited Europe to collect materials for his *Correspondence of the American Revolution* (4 vols. 8vo, 1854). He also wrote, in 1852, two pamphlets in answer to Lord Mahon, on the *Life of Washington.* Besides these multifarious literary labours, combining laborious research with clear arrangement, a simple style and accurate statement he filled, from 1839 to 1849, the M'Lean chair of history, and from 1849 to 1852, that of President of Harvard University. In 1857 he visited Europe. Died at Cambridge March 14, 1866.

SPA'RROW (*Passer* or *Pyrgita*), a genus of birds of the family *Fringillidæ*, having a strong conical bill, the upper mandible slightly curved, the lower mandible compressed and shorter than the upper, the nostrils partly concealed by the short feathers at the base of the bill, the legs moderately long and stout, the claws sharp and curved, the tail moderately long, and nearly even at the top. The species are not very numerous, and are exclusively found in the Old World. The COMMON S., or HOUSE S. (*P. domesticus*), plentiful everywhere in the British Islands, and too well known to require description, is found also throughout Europe, abounding particularly in the northern countries, from which its range extends eastwards into Siberia, and southwards to the north of Africa and of India. Of all British birds, the S. is the boldest in its approaches to man. Town sparrows are not mere visitors from the neighbouring country, but constant inhabitants of the town itself, with the smoke of which their plumage is begrimed. The S. in its best plumage is not a very beautiful bird, nor has it such elegance of form as many others of the finch tribe; it has no melodious song, but its habits are interesting, and its frequent lively chirp pleasing. Sparrows often congregate in great flocks, particularly in autumn, when they find rich supplies of food in the ripened grain. The S. is one of the most omnivorous of birds. Animal and vegetable food seem equally acceptable to it. During summer, vast numbers of insects and their larvæ are devoured by sparrows, and in this way they make amends for their plunder of the grain in autumn, which they begin as soon as it is sufficiently ripened, and continue as long as there are sheaves in the field. Their depredations have induced many farmers to use means for their destruction. They are good to eat, though little used for this purpose in Britain. It is otherwise in France, where all the small birds are sought after as articles of food. But the destruction of sparrows may be carried too far; and in France it has been followed by an increase of caterpillars, vastly more injurious to crops than the sparrows themselves. The S. makes a very inartificial nest, collecting a quantity of hay, or some similar material, in a hole of a wall, and lining it with feathers; sometimes, but more rarely, building a rude dome-shaped nest in the higher branches of a tree. Apart from the habitations of man, which it so much frequents, it often builds in crevices of rocks, or in cliffs on the sea-coast, or under the shelter of the nests of rooks, one rook's nest sometimes covering several nests of sparrows. Several broods are produced in succession, and the breeding season is prolonged over the whole summer, one brood succeeding another. The summer plumage of the S. is more brilliant than that of winter, and the female is of more sober plumage than the male, exhibiting indeed almost no variety of colour.—The TREE S. (*P. montanus*), the only other British species, is very similar to the Common S., but of rather smaller size. It is also a widely distributed bird, frequent over great part of the Old World. It is rarely seen in towns.—In Italy, the Common S. is rare to the south of Piedmont, and another closely allied species (*P. cisalpina*), takes its place, very similar in its habits as well as in its characters.—In America, there are numerous species of *Fringillidæ*, popularly known as sparrows, of which the WHITE-THROATED S. (*Zonotrichia albicollis*) is most nearly allied to the true sparrows. The nostrils are in a small groove, and the tail is slightly forked.—The HEDGE S. (q. v.) is a bird

very different from the true sparrows.—The name S. is popularly given in different parts of the world to many different birds, chiefly *Fringillidæ*.—The bird called S. in the English translation of the Bible is a species of thrush.

SPARROW-HAWK (*Accipiter* or *Nisus*), a genus of *Falconidæ*, ranked among the *ignoble* birds of prey (see FALCONIDÆ and FALCONRY). The bill is curved from the base, short, and compressed; its upper ridge rounded and narrow; the cutting margin of the upper mandible with a distinct festoon. The wings are short; the legs long, slender, and smooth. Only one species is British—the COMMON S. (*A. nisus*, *A.* or *N. frigillarius*), a small hawk, only about twelve inches in length, a considerable portion of the length belonging to the

Sparrow-hawk (*Accipiter nisus*).

tail. It is found in almost all parts of Britain, and in Asia as far south as Bengal, and as far east as Japan. It is not found in America. It very often makes its nest in the deserted nest of a crow. It is a bold, active bird, very destructive to poultry and pigeons. The S. has often been trained for the purposes of falconry, to take land-rails, partridges, and similar game. The S. of Australia (*A. torquatus*) is marked by a collar of numerous bars of white. Its habits are very similar to those of the European sparrow-hawk.—The American S. (*Falco sparverius*), common in most parts of the United States, is similar in size to the European S., but is rather allied to the kestrel.

SPA'RTA, anciently LACEDÆMON, the capital of Laconia, and the most famous city of Peloponnesus, occupied partly a range of low hills on the right bank of the Eurotas, and partly the intervening plain. Its appearance, even in its palmiest days, was by no means equal to its renown, for, though not destitute of handsome public buildings, the severe law ascribed to Lycurgus, that 'the doors of every (private) house should be fashioned only with the saw, and the ceiling with the axe,' exercised a cramping influence on the development of architecture and of the fine arts generally. The natural defences of the place, or, at least, of the long valley of Lacedæmon, in which S. stood, were so great, that it continued unfortified down to the Macedonian period—nearly a century after its mighty struggle with Athens for the hegemony of Greece; and, indeed, it was not regularly fortified till the time of the tyrant Nabis (195 B.C.). Previous to the Dorian conquest, the primitive Achæans of S. seem to have dwelt in four or five scattered hamlets.—These hamlets were welded into one city, so to speak, by the conquerors, and became known as town-districts. The Acropolis of S. occupied a hill in the northern part of the city, and was adorned with a temple to Athena (the tutelary goddess of S.), plated with bronze, whence it was called the Brazen House, and the goddess herself *Chalciœcus* (the Dweller in the Brazen House). On the bronze plates were beautifully sculptured various Greek myths. At the eastern base of the Acropolis stood the Agora, or Market-place, whence streets proceeded to the different quarters of the city. Here stood the public buildings of the magistrates. The Agora contained many statues. The principal street in S., called the Aphetaïs, ran south from the Agora to the southern wall, through the most level part of the city, and was lined with a long succession of monumental edifices, chiefly *heroa* and sanctuaries. Along the banks of the Eurotas stretched the *Dromos* (Race-course), in which were several *gymnasia*, with temples of the Dioscuri, of the Graces, &c., and numerous statues; and still further south lay a broader level, Platanistas, so called from the plane trees that grew there. This was the scene of those mock-contests in which the Spartan youth learned to face without fear the realities of war.

The history of S. is really the history of Laconia. *When* the four hamlets, the *Pre-Dorian* S., originated, we have no knowledge; but it cannot be doubted that their inhabitants were Achæans. It is during the rule of the Achæan princes that the events of the famous, but unhistorical, expedition against Troy, forming the subject of Homer's *Iliad*, are described as taking place. Menelaus, husband of Helen, whose flight with Paris occasioned the Trojan war, was king at S., and it was during the reign of his grandson, Tisamenus (according to the legend), that the Dorians (q. v.) invaded Peloponnesus. The *fact* of a Dorian invasion is universally admitted, but of the details, scanty even as they are, we may safely be sceptical. We cannot even be certain of the date of the event, or even of the century in which it occurred. All that is clear is, that the native Achæan population were deprived of political privileges, and appear henceforth as *Periœci* (q. v.) and Helots (q. v.)—the Dorian conquerors alone forming the historical Spartans. Towards the middle of the 8th C. B. C., the Dorians of S. had not only thoroughly established themselves in their new settlement, but had subjugated the whole of the fertile and beautiful vale of Lacedæmon, commonly known as Laconia, and had begun to cherish ambitious views of extending their supremacy over the other Dorian settlements in Peloponnesus—viz., those of Messenia and Argos. Hence originated the Messenian wars (see MESSENIA), which terminated (668 B. C.) in the complete overthrow of the Dorians of Messenia, who were reduced by the victorious Spartans to the condition of Periœci. Similar struggles occurred both with the older Achæan inhabitants in the centre of Peloponnesus and with the Dorians of Argos, &c., in which the Spartans were generally successful. The development of their warlike and ambitious character is usually ascribed to the institutions of Lycurgus (q. v.); and whatever we may think of that more than semi-mythical personage, the institutions that go under his name were well fitted to make the Spartans exactly what they figure in history—a race of stern, cruel, resolute, rude, and narrow-minded warriors, capable of a momentary self-sacrificing patriotism (as in the story of the 300 heroes who fell at Thermopylæ), but utterly destitute of the capacity for adopting or appreciating a permanently noble and wise policy.

The outbreak of the Peloponnesian war (431 B. C.) brought the rivalry between S. and Athens to a head, and in the mighty struggle that ensued, victory declared on the side of the combatant least capable of maintaining the greatness of Greece. S. now attained the hegemony of Greece; but her insolent tyranny in the hour of her triumph excited the indignation of those whom she held in virtual subjugation, and the glorious retaliations of the Thebans under Epaminondas (q. v.) stripped her of all her splendid acquisitions, and reduced the Laconian state to its primitive boundaries. Later, the rise of the Macedonian power limited still more the Spartan territory, nor did it ever after attain its earlier dimensions. Finally, after a series of vicissitudes, S. passed into the hands of the Romans, became a portion of the Roman province of Achaia, and shared the fortunes of the great republic.

SPA'RTACUS, the leader in the great insurrection of Roman slaves in Southern Italy which took place 73 B. C., and in all probability the first servile captain in point of genius of whom history preserves a record, was a native of Thrace, and originally followed the occupation of a shepherd, but afterwards became a robber-chief. Having the misfortune to be taken prisoner, he was placed in a training-school for gladiators kept by one Lentulus Batiatus, at Capua. A conspiracy to escape was formed among the gladiators (200 in all, and mostly Gauls and Thracians), the heads of which were S., and two Gauls, Crixus and Œnomaus. The conspiracy was discovered; but 70, among whom were the leaders, forced their way through the streets of Capua with cleavers and other such rude weapons as they could seize, defeated a detachment of Roman soldiers sent to bring them back, and established themselves on Mount Vesuvius, where they received considerable accessions to their number—chiefly runaway slaves. Three thousand Roman troops under C. Claudius Pulcher sought to blockade them here and starve them into surrender. S. was now chosen as their leader, with Crixus and Œnomaus for his lieutenants. Descending the hill at a place and in a way totally unexpected, he took his assailants in the rear, and inflicted on them a disgraceful defeat. His original design had been limited to securing his freedom, and making his way back to his own country, nor during the two years that the insurrection lasted did he ever forget this ultimate aim; but in order effectually to carry it out, he recognised the necessity of a far more serious and extensive warfare than had yet been waged, and proclaiming freedom to all slaves, he contrived to raise his trivial mutiny to the dignity of a servile war. Circumstances were favourable. A great portion of Italy, especially of Central and Southern Italy, had been turned into pasture-land (see ROME), and instead of villages of sturdy and independent farmers, who owned the land they tilled, gangs of discontented slaves watched the flocks and herds of great nobles, demoralised by a plethora of ill-gotten riches. It was to these slaves that S. appealed, and his summons was not in vain. Thousands upon thousands rushed to his standard, and victory followed him wherever he went. The story of his triumphs reads like a romance. No knight of chivalry was ever more uniformly successful, for a time. After defeating Claudius Pulcher, he routed and slew Cossinius, legate of Publius Varinus; then he worsted Varinus himself in several engagements, capturing his lictors and the very horse on which he rode. All the southern part of the peninsula now fell into his hands: the country was devastated, the cities either pillaged or garrisoned. But S. knew too well the enormous resources of Rome, and the extraordinary energy which she was capable of exhibiting in the hour of peril, to hope for final success, and he consequently sought to induce his victorious bands to march northward to the Alps, and disperse to their own homes, the Gauls to the west, and the Thracians to the east. But the slaves were too deeply intoxicated with their success to see the wisdom of his proposal, and S. had to continue his career of mere fighting against his better judgment, and embarrassed by the jealousies that are so apt to spring up among undisciplined and servile hordes. What brilliant gallantry and skill he shewed, is known to all readers of Roman history. After the defeat and death of his lieutenants, who had separated from him (72 B. C.), he marched north through Picenum towards the Po, overthrew first one consular army under Cn. Cornelius Lentulus and then another under Gellius Poplicola, and at the head of 100,000 men, meditated a march on Rome. Since the days of Hannibal, there had never been such danger! Fortunately, servile indecision and unwisdom saved the city. S. was forced by his followers to retreat south, and took up his winter-quarters at Thurii, where he held a great fair for the sale of the spoils of Roman cities. In 71 B. C., Crassus (q. v.) took the field against the terrible slave-leader, but for a while even he could do nothing. Near Mutina, the proconsul, C. Cassius Longinus, and the proprætor, Cn. Manlius, were defeated; in Picenum, Mummius, a legate of Crassus's, was utterly routed; at last, however, Crassus succeeded in forcing S. into the narrow peninsula of Rhegium, whence he tried to get into Sicily, with the view of rekindling the servile war that had recently raged in that island, but failed in his attempt, through the treachery of those with whom he had opened negotiations. Crassus now built lines of circumvallation to hem him in, and force him to surrender; but one stormy winter-night, S. broke out of the toils prepared for him, and resumed the offensive, although he had suffered heavily by loss and desertion, and his forces were still further diminished by the formation of an independent army of Gallic slaves, which had no sooner got a leader of its own, than it was annihilated. Near Petelia, he once more defeated his adversaries; but seeing clearly that with such wretched materials as he had he could not hold out much longer, he made a dash at Brundusium, hoping to seize the shipping in the harbours, and get safely across the Adriatic to his native shore, but was baffled by the presence of Lucullus (q. v.). Pompey, too, had returned from Spain. There was nothing left for S. but to die as gallantly as he had lived. Drawing up his army in battle-array, and solemnly slaying his war-horse, he began his last fight in a spirit of heroic desperation, and after performing prodigies of valour, fell unrecognised among the heaps of his slain foes. After his death, the slave insurrection was at an end.

SPASM (Gr. *spasma*) consists in an irregular and violent contraction of muscular parts—involuntary even when the voluntary muscles are concerned. There are two sorts of spasm. In one, there is an unusually prolonged and strong muscular contraction, not rapidly alternating as usual with relaxation, the relaxation only taking place slowly, and after some time. This is known as *tonic spasm* (Gr. *tŏnŏs*, a bracing up) or *Cramp* (q. v.). 'When in a more moderate degree affecting the voluntary muscles generally, it constitutes Catalepsy (q. v.), in which, from the muscles remaining contracted, the limbs will retain whatsoever attitude they are placed in, until the spasm is over. But the extreme example is Tetanus (q. v.), in which the spasms are so violent and so enduring, that they may be said to squeeze the patient to death.'—Williams's *Principles of Medicine*, 2d ed. p. 72. In

the other form of spasm, the contractions of the affected muscles take place repeatedly, forcibly, and in quick succession; the relaxations being, of course, equally sudden and frequent. This is named *clonic spasm* (Gr. *klŏnŏs*, an agitation), and is popularly known as *convulsions*. Chorea (or *St Vitus's dance*), epilepsy, and convulsive hysteria, afford examples of this kind of spasm.

The treatment varies according to the cause of the excessive muscular irritability. Firm pressure on muscles affected with spasm will promote their relaxation, and by strong steady pressure on the masseter muscles, the lower jaw has been depressed, so as to open the mouth, in cases of lock-jaw. The medicines which are employed to counteract irregular or inordinate muscular action are termed *antispasmodics*; but spasm may depend upon so many different causes that the remedies which are found most successful in combating it must vary extremely in their nature. There are, however, a few medicines which appear to exercise a control over spasmodic action generally. These may be termed *pure* or *true* antispasmodics. They are Asafœtida, Cotyledon umbilicus (or Common Navel-wort), Wood-soot, Galbanum, Musk, Rue, Sagapenum, Sumbul (Jatamansi or Musk Root), and Valerian. Amongst the narcotics often useful in these affections, we may especially mention Belladonna, Cannabis Indica (or Indian hemp), Opium, and Stramonium. Sulphuric ether in draught or inhaled, and inhaled chloroform, are often of service. In some cases, remedies which directly depress the vital powers, such as the prolonged use of the warm bath, or even, in rare cases, the abstraction of blood, are the most effectual means of subduing spasm.

SPATHE (*Spatha*), in Botany, a sheathing bract which encloses one or more flowers, as in the *Narcissus*. Very frequently the flowers within a spathe are arranged upon a *spadix*, which is a succulent spike, with numerous flowers, and of which a familiar example may be seen in *Arum triphyllum*. The spadix is a characteristic feature of the Palms, and in them is compound or branching, and in general is not only provided with a common spathe, but with secondary spathes at its divisions.

SPAVIN, a disease of horses, occurs under two different forms, both interfering with soundness. In young, weakly, overworked subjects, the hock-joint is sometimes distended with dark-coloured thickened synovia or joint-oil. This is bog or blood spavin. Wet bandages, occasional friction, a laxative diet, and rest, should for several weeks be diligently tried; and if such remedies prove unsuccessful, the swelling must be dressed with strong blistering ointment, or fired. The second variety of spavin is the more common and serious. Towards the inside of the hock, at the head of the shank-bone, or between some of the small bones of the hock, a bony enlargement may be seen and felt. This is bone spavin. At first, there is tenderness, heat, swelling, and considerable lameness; but as the inflammation in the bone and its investing membrane abates, the lameness is less perceptible, although the animal continues to drag his leg and go stiffly. In recent and slight cases, cold water should be applied continuously; but in serious cases, when the limb is swollen and tender, hot fomentations are best. For several days, they must be perseveringly employed. When the limb is again cool and free from pain, an iodide of mercury or fly-blister should be applied, and the animal treated to three months' rest in a small paddock, the end of a barn, or a roomy loose-box. In persistent cases, firing or setoning usually gives much relief.

SPEAKER, the name given to the presiding officer in either House of Parliament. In the House of Lords, the Lord Chancellor, or Lord Keeper of the Great Seal, is *ex officio* Speaker; and one or more deputy-speakers are appointed by commission to take his place in his absence. Since 1851, it has been the practice to appoint but one deputy-speaker, who is the chairman of the Lords' committee, and should he also be absent, the House can choose a Speaker *pro tempore*. The Speaker of the Lords may speak or vote on any question, and has no more authority than any other member of the House.

In the House of Commons, the Speaker is a member elected to that office at the desire of the crown, and confirmed by the royal approbation given in the House of Lords. A similar office seems to have existed as early as the reign of Henry III., when Peter de Montfort signed and sealed an answer of the parliament to Pope Alexander, *vice totius communitatis*; but the title Speaker was first given to Sir T. Hungerford in the reign of Edward III. The Speaker of the House of Commons presides over the deliberations of the House, and enforces the rules for preserving order: he puts the question, and declares the determination of the House. As the representative of the House, he communicates its resolutions to others, and conveys its thanks or its censures. He is thus the mouthpiece of the House, whence his title seems to be derived. He issues warrants in execution of the orders of the House for the commitment of offenders, for the issue of writs, the attendance of witnesses, the bringing up prisoners in custody, &c. The mace is borne before him by the serjeant-at-arms when he enters or leaves the House; when he is in the chair, it is left on the table, and it accompanies him on all state occasions. He cannot speak or vote on any question, but on an equality of voices he has a casting vote. Both by ancient custom and legislative declaration, he is entitled to take precedence of all commoners.

In the year 1853 the House, with consent of the crown, resolved that in the absence of the Speaker the Chairman of the Committee of Ways and Means should take the chair, and as deputy-speaker he was in 1855 invested, both by resolution of the House and by act of parliament, with the same authority *pro tempore* as the Speaker. In the United States the presiding officer of the House of Representatives of the United States, and presiding officer of each branch of the state legislatures, generally, is called the Speaker

SPEAKING. See READING.

SPEAKING-TRUMPET, an instrument for giving concentration rather than dispersion to the waves of sound originated by the articulation of the human voice, and thereby enabling the sound to be conveyed to a greater distance. It is of the utmost use on shipboard in enabling the officers to convey orders during windy weather from one part of the deck to another, or to the rigging. The invention is ascribed to Sir Samuel Morland, in 1670, though Athanasius Kircher laid claim to it. Morland's trumpet was of the same form as that now in use—viz., a truncated cone, with an outward curve or lip at the opening.

The theory of the action of this instrument has never been thoroughly explained; but it is supposed that the sides of the tube throw the sound back and back in various reflections, until ultimately the waves quit the instrument in parallel lines. It does not seem to depend on vibration of the instrument.

SPEAR, a pointed weapon with a shaft of greater or less length for thrusting, throwing, or receiving an assault. See JAVELIN, LANCE, PIKE.

The *spear foot* of a horse is his far foot behind

SPE'CIES, in Natural History, a term employed to designate groups inferior to genera (see GENUS), but superior to varieties (see VARIETY). In Mineralogy, the term is of very arbitrary application, serving only, like class, order, genus, &c., the purpose of classification, although it thus indicates common characters or points of real agreement among minerals. In organic nature, it has usually been regarded as possessing a higher and more definite signification. No term is more difficult to define.

Naturalists have very generally regarded species as unchanging throughout the longest succession of generations, except within narrow and marked limits, and have substantially adopted the definition of Buffon: 'A *species* is a constant succession of individuals similar to and capable of reproducing each other.' Thus De Candolle, the eminent botanist, says: 'We unite under the designation of a *species* all those individuals that mutually bear to each other so close a resemblance as to allow of our supposing that they may have proceeded originally from a single being or a single pair.' And Cuvier, the great zoologist, describes a species as 'a succession of individuals which reproduces and perpetuates itself.' Here it may be remarked, that even if the permanence of species implied in these definitions were fully ascertained, and their original creation in their present form admitted as unquestionable, it would by no means follow that we must suppose every species to have proceeded from a single individual or a single pair.

But the separate creation and immutability of species are disputed, some naturalists maintaining that species undergo modification, and that existing forms of life have descended by true generation from pre-existing forms. Lamarck was the first to proclaim this doctrine, at least so as to attract much attention, about the beginning of the 19th century. He held that all species, even including man, are descended from species of inferior organisation; whilst to account for the existence of very simple forms at the present day, he had recourse to the supposition of their spontaneous generation. He was followed, with greater caution, by Geoffrey Saint-Hilaire, who regarded what we call species as various degenerations of the same type, but did not believe that the existing species are now undergoing modification. Similar views have since been stated by many authors. But the works which have most strongly directed attention to them, and in which they have been most fully advocated, are the *Vestiges of the Natural History of Creation*, by an anonymous author, published in 1844, and Darwin's work *On the Origin of Species by means of Natural Selection*, published in 1859. This law was independently discovered by Alfred Russell Wallace. Of the other supporters of these views, one of the most eminent is Professor Huxley, who, without fully adopting the views either of the author of the *Vestiges* or of Darwin, advocates 'the hypothesis which supposes the species living at any time to be the result of the gradual modification of pre-existing species,' and maintains that to suppose each species of plant and animal to have been formed and placed on the surface of the globe at long intervals by a distinct act of creative power, is an assumption 'as unsupported by tradition or revelation as it is opposed to the general analogy of nature.'

It is impossible for us to do more than very briefly exhibit the principal arguments which have been urged on this question. Lamarck rested much on the well-known effect of use or exercise in strengthening and enlarging an organ, and of disuse in atrophying it. 'He conceived that, an animal being brought into new circumstances, and called upon to accommodate itself to these, the exertions which it consequently made to that effect caused the rise of new parts; on the contrary, when new circumstances left certain existing parts unused, these parts gradually ceased to exist. Something analogous was, he thought, produced in vegetables, by changes in their nutrition, in their absorption and transpiration, and in the quantity of caloric, light, air, and moisture which they received. This principle, with time, he deemed sufficient for the advance from the monad to the mammal.' The author of the *Vestiges*, from whom this account of Lamarck's views is taken, regards him as in error 'in giving this adaptive principle too much to do;' and says: 'In the present day, we have superior light from geology and physiology, and hence comes the suggestion of a process analogous to ordinary gestation for advancing organic life through its grades, in the course of a long but definite space of time, with only a recourse to external conditions as a means of producing the exterior characters.'

Darwin's views are distinguished by the introduction of what he designates the principle of *Natural Selection*. He maintains the variability of species, and adduces much evidence to shew that variation is continually taking place, in consequence of the external conditions to which plants and animals are subjected. He rests much on the difficulty of distinguishing between varieties and species, and on the changes which are known to result from cultivation and domestication. He dwells on the *selection* which man makes, in order to produce new breeds or varieties, and supposes a similar 'selection' to take place in nature, in the *struggle for life*, which all plants and animals must undergo. This *struggle for life* is, in fact, the foundation of his theory. He shews that every kind of plant or animal must maintain it, and in order to give to it continued existence, must be successful in maintaining it, not only against those other creatures which seek to make it their food, but still more in a competition with those which seek the same nutriment with itself. In this struggle, the stronger, or those which possess anything peculiarly favourable in their organisation, must overcome the weaker, and these must therefore cease to exist. Thus a slight variation, such as often takes place, may be perpetuated; and the possessors of any advantage in the means of procuring food, or in the powers of offence or defence, may entirely displace their less favoured congeners. The modifications thus taking place, Darwin regards as accounting for the changes in organised beings from one geologic period to another, and for the great differences in the plants and animals of different parts of the world. In support of his views, he argues from the tendency to variation seen in cultivated plants and domestic animals, and the perpetuation of the forms so produced in breeds and races; and from the fact, that the variations in cultivated and domestic species are in some cases greater than those which are regarded as affording grounds of specific, and sometimes even of generic or greater distinctions in a state of nature.

Mr Darwin supposes new variations to be continually taking place, but the greater number of these speedily to become extinct; whilst others, becoming perpetuated, and perhaps causing the extinction of the original forms, again give rise to other forms, until some of them have so widely diverged, that all traces of their common origin are lost. He does not, however, commit himself to the opinion that all forms of organic life, or even all plants, or all animals, have a common origin. He completely rejects Lamarck's notion that new and simple forms are continually being produced by spontaneous generation. 'I need hardly say,' he remarks, 'that science in her present state does not countenance the belief that living creatures are now ever produced from inorganic matter,' and he accounts for the existence of low forms of life by saying that 'natural selection includes no necessary and universal law of advancement or development; it only takes advantage of such variations as arise and are beneficial to each

creature under its complex relations of life.' So that even the lowest forms might 'be left by natural selection unimproved, or but little improved,' as geology tells us of infusoria and rhizopods, which have remained for an enormous period in nearly their present state.

That species differ not only in single characters, but in many, Mr Darwin accounts for by reference to unknown laws of the correlation of organs—laws, however, which, although unknown, we know to exist, so that a modification of one organ is attended with modification of other organs, as is exemplified in our domestic breeds.

In further support of the theory of natural selection, the fact is insisted upon, 'that it is the common, the widely-diffused, and widely-ranging species, belonging to the larger genera within each class, which vary most.' He points also to the analogous manner in which species of the same genus vary, as corroborative of his views. He accounts for the absence or rarity of transitional varieties by supposing the predominant forms to have taken possession of their districts, whilst these were in process of being stocked; and that, these districts differing much in their natural characters, the forms originating in the comparatively unextensive intermediate tracts have not been able to contend against them, and have become extinct. He points out the possibility that areas now continuous may not have been so during a long period, and that species may have been formed whilst they were broken up into islands. But this remains a chief difficulty of his theory.

He ascribes to natural selection the results which Lamarck ascribed to use and disuse in the development and atrophy of organs; and thinks it not impossible that the flying squirrels may thus have had a common origin with the true squirrels, and the *Galeopithecus* with the lemurs, although he admits that we have no graduated links of structure connecting them together. 'Nor can I see any insuperable difficulty,' he says, 'in further believing that the membrane-connected fingers and forearm of the *Galeopithecus* might be greatly lengthened by natural selection; and this, as far as the organs of flight are concerned, would convert it into a bat.' Like Lamarck and the author of the *Vestiges*, Mr Darwin rests not a little on the unity of type throughout whole classes of creatures, and the homologies of parts very different from each other, as in the four-limbed structure of the vertebrata generally, and even the articulations of the limbs. He endeavours to trace the eye from its simplest to its most perfect form, and shews how gradual are the transitions found on comparison of existing creatures, from the one to the other. He goes even further, and says: 'Several facts make me suspect that nerves sensitive to touch may be rendered sensitive to light, and likewise to those coarser vibrations of the air which produce sound.'

He dwells at great length on the subject of hybridism and the general sterility of hybrids, endeavouring to shew that it presents no insuperable objection to the theory of a gradual modification of species, their sterility being incidental on other differences, and sterility occurring, as he labours to prove, when varieties are crossed as well as in the hybrids of distinct species. The difficulties presented by geology he obviates very much by insisting on the imperfection of the geological record. He does not adopt the view of the author of the *Vestiges*, that the geological record exhibits to us a succession of animals, corresponding in their progressive development with the fœtal development of the mammalian embryo But he founds an argument on the many connecting links in the general system of nature which fossils supply when compared with existing species. And he endeavours to shew that his theory is perfectly consistent with the known facts of the geographical distribution of species, and in particular with the remarkable facts of the peculiarity of the fauna and flora of some of the lonely oceanic islands, and of the frequent occurrence of the same species both in cold regions comparatively near the pole, and on mountains far remote from each other in lower latitudes; referring the latter class of facts to former geologic periods, when the continental areas were not the same as now, or when the prevailing climatic conditions were very different. And he finds support for his views in the correspondence, without identity, of the floras and faunas of the northern parts of America and of the Old World.

Whatever may be thought of the truth of this theory, it must be admitted to be admirably framed and guarded, and to be maintained not only with great ingenuity of argument, but by the aid of a vast store of scientific information, most skilfully used. Its opponents condemn it as resting on unwarrantable assumptions, and demand some proof, for example, of the transition of organs from a simple or rudimentary to a complex and more perfect state. They also refuse to acknowledge such imperfection of the geological record as Darwin's argument demands, and they insist much on the completeness of the changes which that record discloses, and the absence of transitional forms both among fossils and existing species. Much of what Darwin and other advocates of the same general views contend for, they admit; a certain power of development in organic nature, a 'struggle for life,' and 'natural selection;' but they regard the limits of development and variation as comparatively narrow. Nor would the state of the question, as they believe, be materially affected, if many of what have hitherto generally been regarded as species should be proved to be mere varieties. Any number of such errors of naturalists might be exposed and corrected, without modification of our views of the laws of nature.

The last of these hypotheses, and the most promising of them all, says Principal Dawson, is that which has recently been ably advocated by Prof. Edward D. Cope in memoirs on the 'Origin of Genera,' and the 'Method of Creation,' and which is based on the well-known analogy between embryonic changes, rank in zoological scale, and geological succession.

Its author considers it under four distinct heads, or theories, viz., (1) the theory of Acceleration and Retardation; (2) the theory of Repetitive Addition; (3) of Use and Effort; and (4) of the Conversion of Grade Force.

The *first* is explained as follows, and includes a demonstration of the existence of evolution.

It is well known that in both kingdoms, in a general way, the young stages of the more perfect types are represented or imitated with more or less exactitude by the adults of inferior ones. But a true identity of these adults with the various stages of the higher has, comparatively, rarely been observed. Let such a case be supposed:

In *A* we have four species whose growth attains a given point, a certain number of stages having been passed prior to its termination or maturity. In *B* we have another series of four (the numbering a matter of no importance), which, during the period of growth, cannot be distinguished by any common, *i. e.*, generic, character, from the individuals of group *A*, but whose growth has only attained to a point short of that reached by those of group *A* at maturity. Here we have a parallelism, but no true evidence of descent. But if we now find a set of individuals belonging to one species, and therefore held to have had a common origin or parentage (or still better the individuals of a single brood), which present differences among themselves of the character in question, we have gained a

point. We know in this case that the individuals, *a*, have attained to the completeness of character presented by group *A*, while others, *b*, of the same parentage have only attained to the structure of those of group *B*. It is perfectly obvious that the individuals of the first part of the family have grown further, and, therefore, in one sense, faster, than those of group *B*. If the parents were like the individuals of the more completely grown, then the offspring which did not attain that completeness may be said to have been *retarded* in their development. If, on the other hand, the parents were like those less fully grown, then the offspring which have added something have been *accelerated* in their development.

It is claimed that a consideration of the uniformity of nature's processes, or inductive reasoning, requires us to believe that the groups of species whose individuals have never been found to vary, but which differ in the same point as those in which the above variations have been observed, are also derived from common parents, and the more advanced have been *accelerated* or the less advanced *retarded*, as the case may have been with regard to the parents.

This is not an imaginary case, but a true representation of many which have come under observation. The developmental resemblances mentioned are universal in the animal and probably in the vegetable kingdom, approaching the exactitude above depicted in proportion to the near structural similarity of the species considered.

Example.—It is well known that the *Cervidæ* of the Old World develop a basal snag of the antler (see Cuvier, *Ossemens Fossiles*, and Gray, *Cat. British Museum*) at the third year; a majority of those of the New World (genera Subulo, Cariacus) never develop it except in abnormal cases in the most vigorous maturity of the most northern Cariacus (*C. Virginianus*), while the South American Subulo retains to adult age the simple horn or spike of the second year of all *Cervidæ*. Among the higher *Cervidæ*, Rusa and Axis never assume characters beyond an equivalent of the fourth year of Cervus. Now an abundant race of the American deer, *Cariacus Virginianus*, exists in the Adirondack region of New York, in which the development of the antlers never progresses beyond the spike stage of the second year. Therefore, some of this species belong to Cariacus and some to Subulo.

Another remarkable case illustrating this view is seen in the *Siredon* type of aquatic Batrachia which inhabits the waters of Mexico. They are permanent larvæ of salamanders, of the genus *Amblystoma*, which inhabit North America; that is, they are at maturity identical with the young of the latter genus. But it has been observed that the larva of *Amblystoma* will, in suitable situations, comport itself like an adult animal, and reproduce young, which may remain like the parent *Siredons*, or permanently larval, or may grow further, and become true *Amblystoma*. Other larva-like genera of Batrachia, as *Necturus*, are similar, but not so exactly related, to genera which undergo metamorphosis.

The remarkable and somewhat startling fact that animals change from one genus or family to another without losing their individuality or specific characters is here presented. We here have actual facts on which to base a theory of development; and similar phenomena have been observed among molluscs, insects, &c.

These facts point to the operation of two causes—first, the possible *Retardation* or *Acceleration* of growth, and secondly, the influence of outward circumstances on the organism capable of retardation or acceleration. The most important result is, that having ascertained the series of embryonic changes of any animal, we have thereby ascertained its possibilities in regard to accelerated development. Its possibilities in regard to retarded development may be inferred by similar studies of animals higher in the scale.

The theory of *Repetitive Addition* is based on that of homology of the parts of animals. It states that the construction of the animal types is restricted to two kinds of increase—the addition of identical segments and the addition of identical cells. The first is probably to be referred to the last, but the laws which give rise to it cannot be here explained. Certain it is that segmentation is not only produced by addition of identical parts, but also by subdivision of a homogeneous part. In reducing the vertebrate or most complex animal to its simplest expression, we find that all its specialized parts are but modifications of the segment, either simply or as sub-segments of compound but identical segments. Other animals which present cavities or parts of a solid support are still more easily reduced to a simple basis of segments, arranged either longitudinally (worm) or centrifugally (star-fish, &c.).

Each segment is constructed, as is well known, by cell division. In the growing fœtus the first cell divides its nucleus and then its whole outline, and this process repeated millions of times produces, according to the cell theory, all the tissues of the animal organism or their bases from first to last. That the ultimate or histological elements of all organs are produced originally by repetitive growth of simple nucleated cells, with various modifications of exactitude of repetition in the more complex, is taught by the cell theory. The animal organism transfers the chemism of the food (protoplasm) to correlated amounts of heat, motion, electricity, light (phosphorescence), and nerve force. But cell division is an affection of protoplasm distinct from any of these. Addition to homogeneous lumps or parts of protoplasm (as in that lowest animal, *Protamœba* of Haeckel) may be an exhibition of mere molecular force, or addition, as is seen in the crystal, but cell division is certainly something distinct. It is called *Growth force*, and has been shown by Henry and Carpenter to be correlated to chemism, heat, &c. The whole question, then, of the creation of animal and vegetable types is reduced to one of the amount and location of growth force.

The theory of *Use and Effort* states that the influences locating growth force are: first, physical and chemical causes; second, use; third, effort. The first is not especially prominent in the economy of type growth among animals, and is less important than the two following. The effects of use are well known. We cannot use a muscle without increasing its bulk; we cannot use the teeth in mastication without inducing a renewed deposit of dentine within the pulp-cavity to meet the encroachments of attrition. The hands of the labourer are always larger than those of men of other pursuits. Pathology furnishes us with a host of hypertrophies, exostoses, &c. produced by excessive use, or necessity for increased means of performing excessive work. The tendency, then, induced by use in the parent is to add segments or cells to the organ used. Use thus determines the locality of new repetitions of parts already existing, and determines an increase of growth force at the same time by the increase of food always accompanying increase of work done, in every animal.

But supposing there be no part or organ to use. Such must have been the condition of every animal prior to the appearance of an additional digit or limb or other useful element. It appears that the cause of the determination of growth force is not merely the irritation of the part or organ used by contact with the objects of its use.

In many instances which might be cited, it cannot be asserted that the nutrition of use is not under the direct control of the will through the mediation of nerve force. Therefore growth force may be, by the

volition of the animal, as readily determined to a locality where an executive organ does not exist, as to the first segment or cell of such an organ already commenced, and therefore effort is, in the order of time, the first factor in acceleration.

Effort and use have, however, very various stimuli to their exertion.

Use of a part by an animal is either compulsory or optional. In either case the use may be followed by an increase of nutrition under the influence of reflex action or of direct volition.

A compulsory use would naturally occur in new situations which take place apart from the control of the animal, where no alternatives are presented. Such a case would arise in a submergence of land, where land animals might be imprisoned on an island or in swamps surrounded by water, and compelled to assume a more or less aquatic life.

Preservation with modifications would only ensue where the changes should be introduced very gradually. This mode is always a consequence of the optional use. The cases here included are those where choice selects from several alternatives, thus exercising its influence on structure. Choice will be influenced by the emotions, by the imagination, and by intelligence.

The selection of food offers an opportunity for the exercise of intelligence, and the adoption of means for obtaining it still greater ones. It is here that intelligent selection proves its supremacy as a guide of use, and consequently of structure, to all other agencies proposed. The choice of food under ground, on the ground, or in the trees would necessarily direct the uses of organs in those directions respectively.

Intelligence is a conservative principle, and always will direct effort and use into lines which will be beneficial to its possessor. Thus we have the source of the fittest—*i.e.*, addition of parts by increase and location of growth force directed by the will—the will being under the influence of various kinds of compulsion in the lower and intelligent option among higher animals. Thus *intelligent choice* may be regarded as the ultimate originator of the fittest, while *natural selection* is the tribunal to which all the results of accelerated growth are submitted. This preserves or destroys them, and determines the new points of departure on which accelerated growth shall build.

Acceleration under the influence of effort accounts for the existence of rudimental characters. Many other characters will follow at a distance, the modifications proceeding in accordance with the laws here proposed, and retardation is accounted for by complementary or absolute loss of growth force.

The fourth theory, that of the Conversion of Grade Force, is the most obscure. The proposition is thus stated:

Acceleration is only possible during the period of growth in animals, and during that time most of them are removed from the influence of physical or biological causes, either through their hidden lives or incapacity for the energetic performance of life functions. These influences must, then, have operated on the parents, been rendered potential in their reproductive cells, and become energetic in the growing fœtus of the next generation. However little we may understand this mysterious process, it is nevertheless a fact. Says Murphy, 'There is no act which may not become habitual, and there is no habit that may not be inherited.' Materialized, this may be rendered —there is no act which does not direct growth force, and therefore there is no determination of growth force which may not become habitual; there is, then, no habitual determination of growth force which may not be inherited, and of course in a growing fœtus becomes at once energetic in the production of new structure in the direction inherited, which is acceleration. The explanation of this phenomenon has not yet been attained. That which is communicated through the reproductive elements is a special or specific kind of capacity for the conversion of heat to growth force, and it is assumed that in acceleration more of this is communicated, in retardation *less* of it, than in previous generations.

See Edward D. Cope's *Method of Creation*, in *Proceed. Amer. Philosoph. Society*, 1871; *Hypothesis of Evolution, Physical and Metaphysical*, New Haven, 1870, republished from *Lippincott's Magazine*, 1870; *Origin of Genera*, Philada., 1868, in *Proceedings of Academy of Natural Sciences;* St George Mivart, *On the Genesis of Species*, N. Y., 1871; Alfred R. Wallace, *Malay Archipelago: Contributions to the Theory of Natural Selection;* Herbert Spencer *Principles of Biology*, 2 vols.; Thomas Henry Huxley, *Man's Place in Nature;* Charles Darwin, *Origin of Species*, new edition, New York, 1871; *Variation of Animals and Plants under Domestication*, 2 vols. N. York, 1868; *The Descent of Man, and Selection in Relation to Sex*, N. York, 1871.

SPECI'FIC GRAVITY of any body is the proportion which the weight of a certain bulk of that body bears to the same bulk of another body, which is taken as a standard. The standard for substances solid and liquid is distilled water at the temperature of 62° Fah., barometer 30 inches; and the weight of a cubic inch of this standard is given in the Parliamentary Reports for 1825 as 252·456 troy grains, hence a cubic foot of it weighs 997·129 avoirdupois ounces, or 62·32 avoirdupois pounds. It is convenient to remember that a cubic foot of water weighs about 1000 ounces avoirdupois, as the error resulting from employing this estimate does not amount to much more than $\frac{1}{350}$th of the whole. For aëriform bodies, the standard is atmospheric air, a cubic inch of which, at a temperature of 32° Fah., weighs ·32698, and at 60° Fah., ·30935 grains troy. The specific gravity of solid bodies is best measured by the hydrostatic balance—a figure of which is given under ARCHIMEDES, PRINCIPLE OF (q. v.)—which gives the weight of a volume of water equal in bulk to the solid, by which it is only necessary to divide the weight of the solid in air to obtain the specific gravity; that of liquids may be obtained by the Areometer (q. v.), or by comparing the weight lost by a solid body in the liquid and in water, and dividing the former by the latter—or by means of the *specific-gravity bottle*, which holds exactly 1000 grains of distilled water in its standard condition. The bottle is emptied of water, filled with the liquid, and then weighed; the result gives the weight of a volume of the fluid equal in bulk to 1000 grains of the standard, and hence this weight divided by 1000 gives the specific gravity. The specific gravity of an aëriform fluid is determined by weighing a glass globe filled first with the fluid, and then with atmospheric air. Annexed is a table of the specific gravity of a few of the more common substances.

SOLIDS (METALS).

	Sp. Gr.		Sp. Gr.
Iridium (hammered),	23·	Iron,	7·78
Platinum,	20·15	Tin,	7·29
Gold,	19·25	Zinc,	7·19
Mercury,	14·	Antimony,	6·70
Lead,	11·35	Arsenic,	5·76
Silver,	10·74	Aluminium,	2·67
Bismuth,	9·82	Calcium,	1·58
Cobalt,	7·81	Sodium,	·97
Copper,	8·78	Potassium,	·86
Manganese,	8·01		

OTHER SOLIDS.

	Sp. Gr.		Sp. Gr.
Loadstone,	4·93	Topaz,	4·03
Ruby,	4·28	Diamond,	3·52

Limestone,	2·70	Coal,	1·16
Chalk,	2·45	Amber,	1·08
Glass, Flint,	2·90	Spanish Mahogany,	1·06
Granite,	2·78	English Oak,	·97
Flint,	2·58	Butter,	·94
Clay,	2·16	Ice,	·93
Ivory,	1·92	Human body alive,	·89
Bone,	1·66	Ash,	·84
Sand,	1·50	Elm,	·67
Honey,	1·45	Poplar,	·38
Lignum-vitæ,	1·33	Cork,	·24

LIQUIDS.

	Sp. Gr.		Sp. Gr.
Sulphuric Acid,	1·84	Champagne Wine,	1·
Nitric Acid,	1·5	Burgundy Wine,	·99
Aqua Regia,	1·23	Whisky, average,	·92
Blood,	1·04	Oil of Turpentine,	·87
Oil of Cinnamon,	1·04	Brandy,	·84
Oil of Cloves,	1·03	Alcohol, pure,	·80
Milk,	1·03	Ether, Sulphuric,	·72
Tar,	1·01		

GASES.

	Sp. Gr.		Sp. Gr.
Hydriodic Acid,	4·34	Oxygen,	1·11
Chlorine,	2·44	Olefiant Gas,	·98
Sulphurous Acid,	2·22	Nitrogen,	·97
Cyanogen,	1·80	Prussic Acid,	·94
Carbonic Acid,	1·52	Ammonia,	·59
Muriatic Acid,	1·28	Hydrogen,	·07

SPE'CTACLES, for the purpose of aiding the sight when impaired by age or otherwise (see SIGHT, DEFECTS OF), were invented during the 13th century. The merit is attributed by some to Alexander di Spina, a Florentine monk, and by others to Roger Bacon. At first, they were exceedingly clumsy, both in the lenses themselves and also in their frames; and but little improvement took place in them until the beginning of this century, when light metal frames were introduced, instead of the cumbrous horn or tortoise-shell mountings, which are still occasionally seen, and have obtained the name of goggles. So skilful are the workmen of Wolverhampton, where they are chiefly made, in the manufacture of steel frames, that some of exquisite workmanship are now turned out, which, with their lenses complete, are under a quarter of an ounce in weight. They have consequently displaced gold, silver, and all other materials, when comfort and effectiveness are preferred to useless show combined with inconvenience. The lenses themselves are nearly always made of the best optical glass, and by the best makers are ground with extreme care. Many profess to be made of 'pebbles,' or rock-crystal; but lenses really made of that material are exceedingly rare, and have no real advantage over good glass.

SPECTRE BAT (*Phyllostoma*), a genus of bats having two membranous crests on the nose, the one leaf-like, the other in the form of a horseshoe. This gives to their face that peculiar appearance from which they derive their popular as well as their scientific name. The molar teeth in all the spectre bats have sharp points and edges, shewing that they are very carnivorous. The tongue is extensile and rough, so that it is supposed capable of being used as an instrument both of abrasion and of suction. Their blood-sucking powers have been doubted by some naturalists, among whom is Cuvier, but are now fully established. See VAMPYRE. The species are numerous, and all natives of the West Indies and South America. Some of them are among the largest tropical bats.

SPE'CTRUM (Gr.) is a term applied in Optics to the coloured image of the sun or other luminous body, produced by Refraction through a Prism (q. v.), by Diffraction (q. v.) through a fine grating, &c. In what follows we shall confine ourselves to the spectrum produced by a prism, as that which is commonly used. Besides, so far as we have at present occasion to examine it, it presents very nearly the same appearances as spectra produced by other processes.

The solar spectrum was first carefully examined by Newton, who deduced from his observations the composite nature of white light, and the different refrangibilities of its various coloured constituents. A ray of sunlight enters a darkened room through a small hole, S, in a shutter. It proceeds in a straight line to the opposite wall, and forms at S′, as a circular white spot, an image of the sun. If the edge of a glass prism, P, be interposed in the path of this

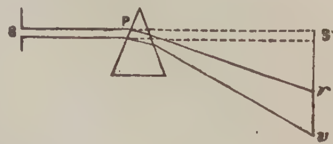


Fig. 1.

ray, the white spot at S′ disappears, and the spectrum, *r*, *v*, is produced. In this form of experiment, its shape is that of a rectangle with semicircular ends, as figured below.

Fig. 2.

The breadth of the spectrum is equal to the diameter of the spot S′; and it is brilliantly coloured, the end *r*, nearest to S′, being red, and the other end, *v*, violet. Between these we have gradations of colour, and the whole appeared to Newton to be divisible into seven differently coloured spaces, which he called red, orange, yellow, green, blue, indigo, violet. This was in accordance with the speculations of old days, when analogies were constantly looked for, and seems to have been suggested to Newton by the common musical scale. It is impossible, however, to settle precisely the exact boundary between any two of these fancied species of colour; and, besides, such a description of the spectrum (though complete enough for mere popular language) is totally inadequate to express our present knowledge of the subject. In order to study the spectrum a little more closely, suppose we have pieces of coloured glass which allow only one definite colour to pass. With a red glass placed at the hole in the shutter, the prism being removed, the effect would be to render the spot S′ red, without changing its position. Introduce the prism, and the effect is to change the position of the spot to *r*, without altering its size or colour.

Fig. 3.

Similarly, with a violet glass we have a violet spot at *v*, and so on; the change of position, due to refraction, being least for red and greatest for violet. It thus appears that the spectrum formed in this way, is made up of a series of circular spots, of the various colours of which white light consists, all of the same size, and having their centres ranged along a line, so that each overlaps those next it. The only parts of the spectrum which are *pure*, i. e., where no two or more colours are mixed, are the ends; so that, by this process, it is impossible to separate definitely the rays of different refrangibility, so as to see, for instance, *whether any are wanting.* How, then, are we to ascertain whether sunlight contains rays of every refrangibility from red to violet? The obvious method is to make the

spot S′ not circular, but long and very narrow, a process mentioned by Newton himself. In such a case our figure would become

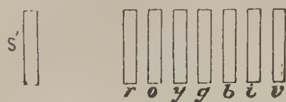


Fig. 4.

and, by making S′ narrow enough, we shall evidently be able to avoid overlapping of the various coloured images, *unless there be present, in white light, rays of every refrangibility from red to violet.* To make this spot S′ thus narrow, a method commonly employed, is to set the prism about half-way between the shutter and the screen, and to place before it a lens, such that, if the prism were removed, S′ would be an image of the hole in the shutter nearly equal to it in size. The hole must, therefore, be a narrow slit, parallel to the edge of the prism. When this arrangement is adjusted we have a pure spectrum, and we find it to be (at first sight) *continuous.* Thus, it appears that sunlight contains rays of every refrangibility, from the highest to the lowest; and that Newton's sevenfold division of it, though sometimes convenient for popular reference, has no scientific basis. Besides, what we can see is not the whole spectrum but a mere fraction of it; for beyond the red end, there are invisible rays recognised at once by their heating powers; and beyond the violet, there are invisible rays more powerful than the visible in producing chemical changes, as on a photographic plate, and which can be changed into visible rays by fluorescent substances. See PHOSPHORESCENCE. The breadth of the visible spectrum evidently depends on the *length* of the slit, its length on the difference of refrangibility of red and violet.

If we cut a narrow slit in the screen on which the spectrum falls, in a direction perpendicular to its length, the light which passes through has a definite refrangibility, and can no longer be drawn out by a prism into a spectrum. This experiment also is due to Newton.

If the slit in the shutter be very narrow, and the prism be adjusted to the most favourable position (so that the incident and refracted rays make equal angles with the surfaces on which they impinge, and from which they escape, respectively), we see that, after all, the solar spectrum is *not* continuous. It is found to be crossed at intervals by dark bands (a few of which are sketched below, fig. 5), shewing the absence of rays of certain definite refrangibilities. The phenomenon is found to be the same whatever be the substance of the prism; so that these rays are really wanting in sunlight.

This important discovery was made by Wollaston, but the bands were first carefully observed and measured by Fraunhofer, from whom they are commonly called *Fraunhofer's Lines.* We owe to Fraunhofer the invaluable suggestion of employing a telescope to examine the spectrum. The refracted rays are received directly on the object-glass of the telescope, which forms an image of the spectrum to be examined with the aid of the eye-piece, the screen being dispensed with. Wollaston had seen only five lines; Fraunhofer at once discovered four hundred; Brewster, with more perfect apparatus, counted two thousand; and now, with a train of prisms, and powerful telescopes, their number seems beyond computation. They shew every variety of breadth and distinctness, and are grouped in the most irregular manner. For reference, Fraunhofer selected some of the more prominent, to which he attached the earlier letters of the alphabet. By their help he was enabled to measure refractive indices (see REFRACTION) with a precision completely unlooked for. If the light of a candle, a bright gas-flame, a white-hot wire, or a lime-ball in the oxyhydrogen flame, be examined in the same way, *no such lines are seen.* But some of them, and others not apparently belonging to sunlight, were found by Fraunhofer in the spectra of various fixed stars—while the light of the moon and planets seemed to give spectra similar to that of sunlight.

The first to throw any light on this subject was Brewster. He shewed that when light passed through nitrous acid gas its spectrum was interrupted by countless lines; and that they increased in number and breadth by the application of heat to the gas, so that at a high temperature a thin layer of this gas is *opaque to direct sunlight.* Hence it was natural to conclude that the dark bands in the solar spectrum are caused by absorption in some medium lying between us and the sun. It is to be observed, however, that this is on the supposition that light as it comes immediately from the sun would give, like that of the lime-ball, a continuous spectrum. But Brewster went farther. He shewed that *some* of Fraunhofer's lines depend on the altitude of the sun, that is on the greater or less space of air, fog, and vapour through which his rays must pass before reaching the earth. *Some of them,* then, *are caused by absorption in the earth's atmosphere.*

But we must now look to another class of phenomena. A spirit-lamp flame gives a very feeble spectrum; and, if a little common salt be put on the wick, although the flame becomes instantly very much brighter, no alteration is produced on the spectrum save the appearance of a *bright* yellow line crossing it at the place where the dark line, called by Fraunhofer, D, appears in sunlight. On examining this line carefully, Fraunhofer found that it, like D, is double—and he verified that these two rays were exactly (so far as refractive index goes) two of those wanting in sunlight, and in the light of some of the stars.

About the same time Talbot and Herschel (q. v.) shewed that the colours given by Lithia, Strontia, &c., in a spirit-flame were, like that produced by common salt, due to the production of light of several perfectly definite refrangibilities: so that the spectrum of the lamp-flame was crossed in each case by a series of bright lines, always the same when the same body was placed in the flame; and they suggested (in 1825) the application of this method to the qualitative analysis of minerals, &c., when the presence of extremely minute quantities of different bodies has to be ascertained. This was, in reality, the foundation of SPECTRUM-ANALYSIS; and the method was, we may say, almost complete so far as practice is concerned. The theory, however, was left incomplete so far as regards the cause of dark lines in the solar spectrum. Foucault (in 1849) seems to have been the first to approach the true explanation. An experiment of his, from which, however, he drew no inferences, contains the complete theory. When salt is placed in the voltaic arc (ELECTRIC LIGHT, q. v.) the spectrum gives the double bright line (coinciding with the double dark line D) already referred to. When sunlight passes through this arc its dark line D is *strengthened,* instead of being filled up, by the yellow light from the arc as we might have expected; and when one of the white-hot carbon-points (which gives a continuous spectrum) is looked at through the yellow arc, the double dark line D appears in its spectrum.

Stokes learning, in 1850, that experiments had been made by Professor Miller of Cambridge, to

test with great accuracy Fraunhofer's assertion as to the exact coincidence of the double bright line of a salted flame with the double dark line of the solar spectrum, gave for the first time the physical explanation of the phenomenon. He compared the salt-flame to a space full of tuning-forks or pianoforte wires all tuned to the same note. When they are in vibration they, of course, give out this note —similarly the salt-flame the *bright* lines. When, however, sounds are produced in their neighbourhood, as they naturally vibrate to one definite note, they will be set in vibration by it (i. e., will absorb it) if it be part of the sound.—Thus sound which has passed through such a space has had this note eliminated from it—similarly the salt-flame seizes these yellow rays from white light passing through it. This ingenious and satisfactory explanation shews at once that the line D proves the existence of salt (or sodium) in the atmosphere of the sun. Stokes's theory was not published, except in so far as it was annually given by W. Thomson (q. v.) in his lectures in Glasgow—so that it was independently discovered, or all but discovered, by various other philosophers some 8 or 10 years later. The earliest of these was Balfour Stewart of the Kew Observatory, who proved by reasoning and experiment that a body's absorbing power for any ray of light or heat is equal to its radiating power for the same. Augström all but made the rediscovery. Finally, Kirchhoff, by reasoning similar to that of Stewart, and by actually reversing the spectra of certain substances, arrived at the same results; and, in conjunction with Bunsen, applied them to chemical analysis, with the immediate result of discovering two new metals.

One of the most valuable parts of Kirchhoff's investigation, is his map of the solar spectrum with its dark lines; side by side with which is a spectrum containing the bright lines given by various metals volatilised in an electric spark. The sunlight is admitted through the upper half of the slit, the light from the burning metal through the lower—and thus the two are subject to precisely the same deflections by the train of prisms. The following figure shews a very small portion of Kirchhoff's drawing, and exhibits the exact coincidence of the bright lines produced by highly heated vapours of iron, manganese, nitrogen, and calcium, with corresponding dark lines in the solar spectrum. The particular portion exhibited (in the middle of the green), is chosen because it contains few lines whose origin has not been ascertained. But *every* bright line in the iron spectrum has a corresponding dark line in the solar spectrum. Kirchhoff has calculated

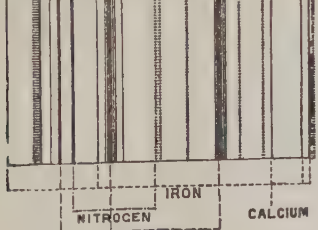


Fig. 5.

from his data the probability that the sun's atmosphere contains iron; and finds it to differ from certainty by a quantity almost inconceivably small.

The applications of the spectrum-analysis are becoming more numerous every day. We have space only for two of the most beautiful and important. Huggins has lately shewn that the spectra of planetary nebulæ, and of the tails of comets, consist of a few *bright* lines only—indicating that these bodies—or, at all events, those portions of them from which their light proceeds—are masses of incandescent vapours or gases.

Again, Stokes has traced, by the alteration of the absorption bands produced by the colouring matter of blood, the oxidation and reduction which constantly take place in this substance, and its connection with the distinction between venous and arterial blood.

SPE'CULUM METAL, an alloy of copper and tin, used for making the reflecting surfaces of reflecting telescopes. The best consists of 126·4 parts copper to 58·9 tin. To obtain a perfect alloy, and to cast it successfully, is a matter of great difficulty, requiring much skill and experience. See TELESCOPE.

SPEE'DWELL (*Veronica*), a genus of plants of the natural order *Scrophulariaceæ*, distinguished by


Germander Speedwell (*V. Chamædrys*).

a 4-cleft wheel-shaped corolla, with the lower segment narrower, two stamens, and a two-celled capsule. The species are very numerous, annual and perennial herbaceous plants and small shrubs, natives of temperate and cold climates in all parts of the globe. Some of them grow in wet ditches and in marshes, some only on the driest soils. They have generally very beautiful blue, white, or pink flowers. The number of British species is considerable, and few wild-flowers are more beautiful than the Germander S. (*V. Chamædrys*), or the alpine species, *V. alpina* and *V. saxatilis*. A number of species are very generally cultivated in flower-gardens.—The bitter and astringent leaves of the COMMON S. (*V. officinalis*), one of the most abundant British species, found also in almost all the northern parts of the world, are in some countries used as a tonic, sudorific, diuretic, and expectorant medicine. They are also employed, particularly in Sweden, as a substitute for tea; as are those of the Germander S., which are said to afford a really pleasant beverage.—*V. Virginica* is called *Calver's Physic*; it is said to be actively diuretic, and a decoction of the fresh root is violently cathartic and emetic.—Brooklime (q. v.) belongs to this genus.

SPEKE, JOHN H. See SUPPLEMENT in Vol. X.

SPELE'RPES, *Raf.* A genus of tailed Batrachia peculiar to North America and Mexico, having biconcave vertebræ, cartilaginous carpus and tarsus, patches of pterygoid teeth, and a mushroom-shaped tongue.

SPELT. See WHEAT.

SPELTER. See ZINC.

SPENCER, JOHN CHARLES, EARL, English minister and statesman, son of the second earl, was born in 1782.—The third earl, the subject of this notice—better known under the courtesy title of Lord Althorp—was educated at Harrow School, and afterwards at Trinity College, Cambridge. He entered parliament in 1804 as member for Oakhampton. In 1806, his father took office as Secretary of State for the Home Department in the Grenville-Fox ministry, and S. became a junior Lord of the Treasury. He was returned for Northamptonshire, which he represented from 1806 until the period of the Reform Bill. In the Reformed parliament he sat for the southern division of the county. He went out with the Whigs in 1807, and during the long interval of their exclusion from office, steadily opposed the measures of the Tory government. On the dissolution of the Wellington cabinet in November 1830, he was appointed Chancellor of the Exchequer and leader of the House of Commons in the celebrated Reform ministry of Earl Grey. The Reform Bill was introduced by Lord J. Russell (q. v.), but the task of carrying the bill mainly devolved upon Spencer. In 1833, he brought in and carried the ministerial Bill for reforming the Irish Church. In this memorable working session, the curious statistician discovered that S., who had, from his post of ministerial leader, naturally been the most frequent speaker, had addressed the House 1026 times, his speeches occupying 387 columns in the then *Mirror of Parliament*. In 1834, he introduced and obtained the assent of the legislature to the Poor-law Amendment Act. When the Irish Coercion Bill was under consideration in the cabinet, S. had opposed the clauses prohibiting public meetings, yet had given way rather than break up the ministry; but when the truth was elicited in debate by Mr O'Connell, S. resigned. He was considered and described by Earl Grey as his 'right-hand man,' and without his assistance the earl felt himself unable to carry on the government. The administration of Viscount Melbourne succeeded (July 1834), in which S. consented to resume his office. In November he was called by the death of his father to the House of Peers, which had the effect of bringing the Melbourne (q. v.) administration to an end. When the attempt of Sir R. Peel to carry on the government failed, S. declined to take office again. He devoted his time to agricultural pursuits, became President of the Smithfield Cattle Club, and suggested the formation of the Royal Agricultural Society, of which he was elected President in 1838. He died at his seat, Wiseton Hall, Notts, October 1, 1845, without issue, and was succeeded by his brother. During his political career, his simplicity of character and integrity of purpose obtained for him the appellation of 'honest Lord Althorp.' He was very little of an orator, but he had a clear and practical intellect, and his influence over the Reformed House of Commons was supreme. Lord Brougham dedicated to him his work on *Natural Theology;* and his *Dialogues on Instinct* are also supposed to be carried on with S., to whose cultivation of philosophy in the midst of his other pursuits, the author bears testimony.

SPENCER, HERBERT. See SUPP. in Vol. X.

SPENCER GULF, a very large and important inlet on the coast of South Australia (q. v.), between Eyria Peninsula on the west, and Yorke Peninsula on the east. It is about 200 miles in length, and is 100 miles in greatest breadth.

SPENER, PHIL. JAK., an illustrious German reformer, and the founder of the sect known as *Pietists*, was born at Rappoltsweiler (Fr. Ribeauville) in Upper Alsace, January 25, 1635. His father was legal adviser to the Count von Rappoltsweiler. At an early age, S. shewed deep religious susceptibilities. After studying the classics at Colmar, he betook himself in 1651 to Strasburg, where the professors Dannhauer and Seb. Schmidt inspired him with a profound love of the Scriptures, not as a heap of dry theological bones, but as a fountain of life and spiritual thought. From 1659 to 1662, he attended the universities of Basel, Tübingen, Freiburg, Geneva, and Lyon. In the following year, he became a preacher at Strasburg, where the unction of his sermons exercised a powerful influence on his hearers. At the age of 31, he was transferred to Frankfürt as first pastor; and here, as elsewhere, the profound spiritualism of the man, springing out of a free simple *un*theological faith in the Bible, made itself apparent in his preaching and life. Yet S. was the very opposite of what is commonly called a *mystic*. The devotion which he sought to excite were not to shew themselves in transcendental ecstasies, amid which common sense is apt to swoon away, but in acts of piety, humility, and charity. The 'Sermon on the Mount' was the medium through which he gazed upon the 'truth as it is in Jesus.' He had a strong aversion to what goes by the name of theology, which he considered a hateful caricature of the free word of life; and he commenced in the year 1670, at his house, meetings for the cultivation of evangelical morality. These were the famous *collegia pietatis*, whose influence for good on the German character, in those days of stony and barren orthodoxy, cannot easily be overvalued. At the same time he took pains to reorganise the method of catechising, and to improve the religious instruction given to children. His conduct in all this was marked by such prudence and discernment, that he long escaped the animadversions of the 'high and dry' Lutherans; but in 1679, a preface which he wrote for a new edition of the *Postille* of Arndt, in which he censured the morals of the upper classes, made him the target for their envenomed shafts; and after some years, he was fain to accept the invitation to become court-preacher at Dresden, and member of the Upper Consistory. In this capacity, he effected important ameliorations in the theological teaching of the university of Leipsic, and in the system of religious catechising practised throughout Saxony; but in 1689 he fell into disgrace for having addressed a temperate but energetic remonstrance to the Elector Johann Georg III., on the subject of his personal vices, was attacked by Carpzow, who coveted his place at court, and by other orthodox theologians, and in 1691 went to Berlin as Provost of the Church of St Nicholas, and consistorial inspector, offices which he retained to the end of his life. The Elector of Brandenburg encouraged his efforts after religious reform, and intrusted theological instruction in the new university of Halle to Franke, Breithaupt, and other disciples of S.—a matter that excited great irritation in the theological faculties of Wittenberg and Leipsic, which had formally censured as heretical no less than 264 propositions drawn from S.'s writings. S. died at Berlin, February 5, 1705, leaving behind him a reputation for piety, wisdom, and practical Christian energy, which all the excesses of the later pietists have not obscured. His writings are numerous; the chief are *Pia Desideria* (Frankf. 1675), *Das geistliche Priesterthum* (Frankf. 1677), *Christliche Leichenpredigten* (13 vols., Frankf. 1677), *Des thätigen Christenthums Nothwendigkeit* (Frankf. 1679), *Klagen über das verdorbene Christenthum* (Frankf. 1684), *Evangelische Glaubenslehre* (Frankf. 1688), and *Theologische Bedenken* (Halle, 5 vols., 1700—1721). See Hossbach's *Phil. Jak. S. und seiner Zeit* (2 vols., Berl. 1828); Thilo's *S. als Katechet*

(Stutt. 1841); and Wildenhalm's *Phil. Jak. S.* (Leip. 1842—1847).

SPENSER, EDMUND, one of the chief literary ornaments of the great Elizabethan period, was born in London in the year 1553. There is some ground for supposing him to have been of good family connection; but inasmuch as of neither of his parents is any thing whatever known, the evidence of this is precarious. In 1569, he went to Pembroke Hall, Cambridge, in the humble capacity of sizar, in itself a sufficient proof that whatever his family, the gifts of fortune were deficient. At Cambridge, he remained several years, becoming Bachelor of Arts in 1572, and Master in 1576. After leaving college, he went to live with friends in the north of England. Of the detail of his life at this period, nothing is known further than that he busied himself with poetry, his first volume of which, *The Shephearde's Calendar*, was published in 1579. Its dedication to Sir Philip Sidney was the means of introducing him to that noble and kindly gentleman, who not only extended to him a generous patronage, but honoured him with his warm friendship. He seems for some time to have been domesticated with Sir Philip at Leicester House, from which he dates his moiety of the *Foure Epistles*, exchanged between him and Gabriel Harvey, and printed in 1580. Towards the end of this year, through the influence of Sidney's uncle, the Earl of Leicester, an appointment was procured for him as secretary to Lord Grey of Wilton, the queen's deputy in Ireland, whither he at once proceeded. About this time it was that he commenced his great work, *The Faery Queen*. His official duties must have been punctually and ably performed, as in 1586 we find his services rewarded by a grant from the crown of Kilcolman in the county of Cork, an estate of upwards of 3000 acres, on which he now went to reside. Along with this piece of good fortune, came the evil news to him of the death of his friend Sidney at Zutphen, an event which he musically bewails in the elegy entitled *Astrophel*. Subsequently, the place of Sidney, as at once his patron and friend, was in a measure supplied by Sir Walter Raleigh, who visited him in Ireland in 1590, took him along with him to England, and introduced him to the notice of Queen Elizabeth. His experiences as a suitor for court-favour seem not to have been specially of a pleasant kind, if we may judge from a passage in one of his works, in which a keen personal feeling of wrong and weary humiliation speaks out unmistakably. Documentary evidence exists, however, that a pension of £50 per annum was granted him by Queen Elizabeth; that it was ever paid, or paid with due punctuality, there seems considerable reason to doubt. That Elizabeth, along with her greater qualities, could exhibit on occasion an extreme meanness and stinginess, there is no reason to doubt whatever. What portion of S.'s after-life was passed in England, what in Ireland, we do not distinctly know. Nearly all we distinctly know of him henceforth is the date of his several publications. The first three books of *The Faery Queen*, issued on his arrival in England in 1590, were followed the year after by three more, and a collection of lesser pieces entitled *Complaints*, including *Mother Hubbard's Tale*, the *Tears of the Muses*, &c.; and in 1596, by four *Hymns*, so called, in which the Platonic doctrine of Beauty is elaborated in noble music. In 1596, he wrote his *View of Ireland*, a treatise full of sagacious observation and remark, which was only published long after in Dublin in 1633. Further than this, all record which survives to us of S. is summed in the facts, that in 1594 he was married to a woman whose very name has perished; that in 1598 he was made sheriff of Cork by the queen; and that in the course of the same year the deplorable calamity befel him, which shortly preceded, and, in part, may have caused his death. Tyrone's rebellion having broken out, his house at Kilcolman was sacked and burned by the rebels, he and his wife with difficulty escaping, whilst their youngest child perished in the flames. On January 15, 1599, his death took place in London. According to the account given by Ben Jonson to Drummond, he '*died for lake of bread.*' This is not likely to have been in the literal sense true, but it is scarce possible to evade the inference from it, as coming from one so likely to be well informed as Jonson, of a state of great wretchedness and destitution. He was buried by his own request near Chaucer in Westminster Abbey, at the expense of the Earl of Essex, who is said, in the account by Jonson, to have tendered him succour on his death-bed, though too late to be of any avail.

S. takes admitted rank as one of the very greatest of British poets; and his chief work, *The Faery Queen*, written in that stateliest of English measures, since known by the name of its inventor, tedious as it is in its allegory, and in much of its diction obsolete even when written, is a masterpiece of opulent genius. In the poetry of S., an ever-present seeking for and sense of beauty finds its fit expression and reflex in a fluent succession of sweet and various cadences; in breadth and splendour of pictorial effect, it has never, perhaps, been surpassed; such a lavish exuberance in detail as we find in it, has seldom been so combined with a total impression of chastened and majestic sobriety; and throughout it is pervaded by that atmosphere of moral wisdom and serenity which Milton reverently recognises in 'the sage and serious Spenser.'—See *Spenser and his Poetry*, by Prof. S. L. Craik (3 vols. 1845). The most complete edition of the poet's works is that by Todd (Lond. 8 vols. 1806); but a new edition, with glossary, notes, and life, by J. P. Collier, was announced in 1862.

SPENSE'RIAN STA'NZA. See METRE.

SPERMACE'TI is a waxy matter obtained from a cavity in the head of the whale, *Physeter macrocephalus*. See CACHOLOT. It is separated from the oil, in which it is originally dissolved, by boiling water, from which the spermaceti crystallises as it cools. It is then purified by being remelted in a weak solution of potash, and the impurities skimmed off, and it is finally melted again by the action of steam, and cooled slowly in moulds. Its specific gravity is 0·943; it is scarcely unctuous to the touch; does not melt under 100°, has little taste or odour, and occurs in pearly-white, glistening, translucent crystals. It was generally regarded by chemists as a palmitate or cetylate of oxide of cetyl; but according to Heintz, who has studied the fats and their allies more, perhaps, than any other living chemist, it contains four alcohols (which act as bases), united with lauric, myristic, palmitic, and stearic acids.

Spermaceti is an emollient and demulcent, and is hence a useful ingredient in cough mixtures. It is, however, chiefly used externally as an ingredient in various ointments. The *Spermaceti Ointment* of the Pharmacopœia consists of a mixture of spermaceti, white wax, and almond-oil.

SPERMATOZOA. See SUPPLEMENT in Vol. X.

SPEY'ER, also **SPEIER** (Fr. *Spires*), the capital of Rhenish Bavaria (the former Palatinate), and one of the oldest towns in Germany, stands at the influx of the Speyerbach into the Rhine, 14 miles south-west of Heidelberg, and 23 north of Carlsruhe. It is connected with Mannheim, and thence with the rest of Germany, by railway. The principal building is the cathedral (founded 1030), which contains the

tombs of numerous emperors of Germany. Since 1856, it has been wholly renewed, and is the grandest specimen of Romanesque architecture in Europe. It has a hall of Roman antiquities discovered in the Palatinate, and is adorned with thirty magnificent frescoes by Schraudolph.

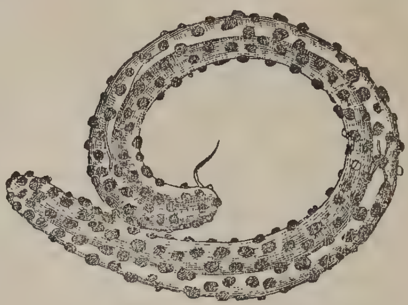
Except the cathedral and a ruined wall, the sole relic of the imperial palace in which twenty-nine diets were held—at one of which (1529) the Reformers made their famous 'protest,' and got for themselves the name of Protestants (see PROTESTANT)—S. does not contain a single ancient building. This is owing to the fact, that in the Orleans Succession War—well called by the Germans the *Mordbrenner Krieg*—during which the whole Palatinate was savagely wasted, S. was taken by the French, its inhabitants driven out, and the city blown up with gunpowder, and burned to the ground. Only the cathedral resisted the barbarous efforts to mine it. Everything else was reduced to rubbish, and for long years the noble old pile overlooked nothing but a melancholy waste of ruins. In 1794, it was wasted by the French under Custine, and has never recovered from these calamities. S. manufactures vinegar and tobacco, and has some transit-trade on the Rhine. Pop. 14,806, of whom about one-third are Catholics.

S. is the *Noviomagus* of the Romans, and was the capital city of the Nemetes, a German people. S. was probably the native name from the first, for in some of the later Roman notices it is called *Civitas Nemetum, id est Spira.*

SPE'ZIA, a city of Northern Italy, province of Genoa, and 60 miles south-east of the city of that name. Pop. 24,127. It is situated near the inner point of the gulf of Spezia. The gulf is formed by the bifurcation of a spur of the Apennines, and is 3½ miles long, and 3 miles broad; its western shore is indented by many coves or creeks, five of which—Porto-Venere, La Castagna, the Varignano (the Quarantine station), Grazie, and Panigaglia—are so deep that large men-of-war may be moored in them. The Emperor Napoleon I. recognised the importance of this gulf, and at one time designed, it is said, to make it the chief naval station of his empire in the Mediterranean. Now, the Italian government has made it the station for its ships of war, and operations have been already begun for making it the great arsenal of the state. The scenery of the gulf is very beautiful, and the mildness of its climate was famous in ancient times, when it was known as the Gulf of Luna. The soil produces olives, excellent wines, fruits, &c., and the town has become within recent years a much frequented watering-place. There are numerous foreign consulates. Steamers perform the voyage from S. to Genoa in eight hours. On the eastern side of the gulf stands Lerici (q. v.).

SPE'ZZIA (the ancient *Tiparenos*), a small Greek island at the entrance to the Gulf of Nauplia. Pop. 9400. The island is unfruitful, and its people are engaged chiefly in commercial pursuits. The town of S., on the north coast, has little more than 3000 inhabitants.

SPHÆRULA'RIA, a very remarkable nematode, or round worm, which exists as a parasite in various species of bees. The female is almost an inch in length, has a nearly uniform diameter of $\frac{1}{16}$th of an inch, is of a whitish colour, is bluntly pointed at each end, and is covered with numerous (about 800) small button-like projections—a peculiarity to which it owes its name. There is neither mouth, œsophagus, intestine, nor anus, and the whole animal consists of little more than an elongated mass of fatty tissue and reproductive organs, which in full-grown individuals contain ova in various stages of development. Although the female was discovered in 1836 (by Leon Dufour), it was not until January 1861 that the discovery of the male was announced by Mr Lubbock in his memoir on this parasite in



Sphærularia bombi; Male and Female:
Magnified 9 diameters. The male is seen as a thread-like appendage attached to the extremity of the female.—From Cobbold's *Entozoa.*

The Natural History Review. The male is more than 28,000 times smaller than the female, which accounts for its having been previously overlooked. It is frequently found sexually united to the female in the same manner as occurs in *Sclerostoma syngamus* (q. v.), the parasite which gives rise to the *Gapes* in various birds.

SPHA'GNUM, a genus of Mosses, whose spore-case is an urn closed by a deciduous lid, and its brim toothless, the calyptra irregularly torn. Several species are natives of Britain, and are common in bogs, from which they derive their popular name, BOG MOSS. They are remarkable for the whitish colour of their leaves. They are very elegant plants. They often grow in considerable masses, absorbing water like a sponge, but becoming friable when dry. They contribute much to the formation of peat. Gardeners employ them in preference to other mosses for covering the roots of plants and keeping them moist, as they have in a high degree the property of absorbing moisture from the atmosphere. They have been used as food in barbarous countries, but are very slightly nutritive. The cells of the leaves are remarkable for their spiral structure, and for large pores in their sides.

SPHE'GIDÆ, or SPHECIDÆ, a family of hymenopterous insects, winged in both sexes, and much resembling bees or wasps in general appearance. They are solitary in their habits. Many of them burrow in sand, and are known as *Sand-wasps.* They are extremely active and restless, and may be seen running about on sandhills, with their wings in constant motion. Some of them carry spiders, and others caterpillars, into their burrows, as food for their larvæ, placing them there when the egg is laid, and stinging them so as to render them torpid, without killing them. They display wonderful energy and perseverance in dragging the spider or caterpillar to the burrow. They are mostly tropical insects, but some species are found in Britain.

SPHE'NOID BONE (Gr. *sphēn*, a wedge, and *eidos*, form) is situated at the anterior part of the base of the skull, and articulated with all the other cranial bones, which it wedges firmly together. It somewhat resembles a bat with its wings extended, and hence was termed the *Os vespertilionis.* It is divisible into a body, the greater and lesser wings, and various processes. The greater wings present three surfaces: a superior or cerebral surface, forming part of the floor on which the brain rests; an

anterior surface, which assists to form the outer part of the orbit of the eye; and an external surface with a rough ridge, giving attachment to the external

The Upper or Cerebral Surface of the Sphenoid Bone :

1, The olivary process; 2, the ethmoidal spore; 3 and 4, the lesser and greater wings on the left side; 6, the extremity of left pterygoid process; 7, the foramen for the optic nerve; 10, the sella turcica on which the petuitary gland rests; 12, the basilar portion of the bone, joining with the occipital; 13, part of the sphenoidal fissure which separates the greater from the lesser wings, and transmits the 3d, 4th, the ophthalmic division of the 5th, and the 6th nerves, with the ophthalmic vein; 14, the foramen rotundum, transmitting the second division of the 5th nerve; 15, the foramen ovula, transmitting the third division of the 5th nerve; 16, the foramen sponosum for the passage of the middle meringeal artery.

pterygoid muscle, one of the most powerful muscles of mastication. The second, third, fourth, fifth, and sixth cranial nerves emerge from the cranial cavity through foramina in this bone. Although considered in human anatomy as a single bone, it may be regarded as composed of several bones, which, after a time, unite with one another, as the basi-sphenoid, the pre-sphenoid, the ali-sphenoid, and the orbito-sphenoid bones.

SPHERE, a regular solid figure, every point of whose surface is equally distant from its centre; and whose outline is traced by a circle revolving round its diameter. All sections of a sphere by a plane are necessarily circles, and all sections by planes passing through the centre, or by planes cutting the sphere at equal distances from the centre, are equal. The former sections are called *great*, and the latter *small, circles.* Small circles may vary in size between a mere point and a great circle, approaching either limit as nearly as we please. The surface of a sphere is equal to that of four of its great circles, or (taking x for the radius of the sphere) to $4\pi x^2$; and its volume to that of a cone whose altitude is twice that of the sphere, or $4x$, and whose base is a great circle of the sphere, the formula for it being $\frac{4x}{3} \times \pi x^2$, or $\frac{4}{3}\pi x^3$. The most remarkable geometrical property of the sphere is the relation which its surface and volume bear to those of the 'circumscribing' cylinder (i. e., a cylinder whose length and diameter of each end are each equal to the diameter of the sphere, and in which, therefore, the sphere will be exactly contained. The concave surface of such a cylinder is exactly equal to the surface of the sphere; and not only so, but if a section parallel to the base of the cylinder be made through both cylinder and sphere, the curved surfaces of the portions cut off are equal, whether such portion be cut off from one end or be intercepted between two parallel sections; it follows from this that the curved surface of any section of a sphere with parallel ends is equal to the product of the circumference of a great circle of the sphere by the height or thickness of the section, and that the curved surfaces of all sections of a sphere are proportional to the thickness of such sections. The volume of the sphere, also, is equal to two-thirds of that of the circumscribing cylinder.

SPHE'ROGRAPH, a simple and exceedingly efficient instrument for the mechanical solution of such problems in spherical trigonometry as navigation, geography, &c. present, was invented in 1856 by Mr Stephen Martin Saxby, R.N. It consists of two circular pieces of paper, the whole of the under and the rim of the upper being made of stout card-board, and the interior portion of the upper one of strong transparent tracing-paper; these two circles are attached by a pin through their common centre, the pin being made to work in an ivory collar, so as to prevent any lateral motion of either circle. Round the pin as centre, equal circles are drawn, one on each sheet; each circle is then filled in with lines representing meridians and parallels according to the stereographic projection, and the instrument is completed. As one of the chief uses of the spherograph is to shew the course, distance, and differences of latitude and longitude in 'Great Circle Sailing' (q. v.), we shall give a problem of this sort in illustration of the working of the instrument. Fig. 1 represents the appearance presented by the spherograph when the two poles are separated from each other by an angular distance of 40°; the lines drawn on the under circle (represented by *dotted lines* in

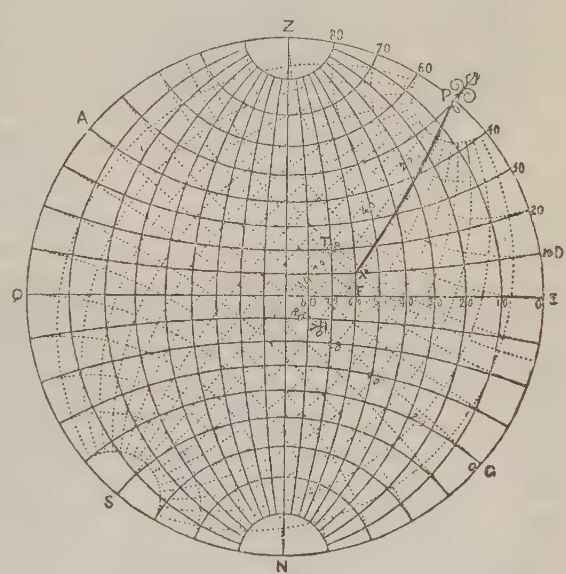


Fig. 1.

the fig.) shewing through the transparent paper which forms the upper circle, on which the continuous lines are delineated. Suppose, then, that a ship is in lat. 50° N., long. 20° W., and is bound for a point in lat. 10° N. and long. 80° W., and that its great circle track, &c., are required: let P, the pole of the under circle, represent the place of the ship (the circle ZPD always representing the meridian of the point of departure, and the upper circle, whose pole is Z, representing the earth's hemisphere), which is done by turning the upper circle till P appears at lat. 50° N.; X represents the point to be

arrived at, and consequently PX, the arc of a great circle passing through P and X, is the great circle track, PD is the difference of latitude, EF the difference of longitude; the spherical angle XPD, measured by GH, an arc of a great circle, of which P is the pole, is the course; and the length of PX is measured by PT, the portion of PS which is cut off by a parallel of the under circle through X, in degrees. The data, then, being as above, we find by inspection of the instrument the difference of lat. = 40° S., the difference of long. = 60° W., the course = S. $72\frac{3}{4}$° W., and the distance = $63\frac{1}{3}$° = 3800 nautical miles. Besides the saving of time and labour by the use of this instrument—the whole work being the *setting* of the instrument, and then the reading off of the required elements—it is evident that the substitution of a mechanical solution for calculation greatly lessens the probability of error. It is found that spherographs of 5 inches radius give results of sufficient accuracy for all the purposes of the navigator.

All other spherical problems can be solved with equal facility by this instrument, but one more example will suffice. Let Z (fig. 2) now represent the

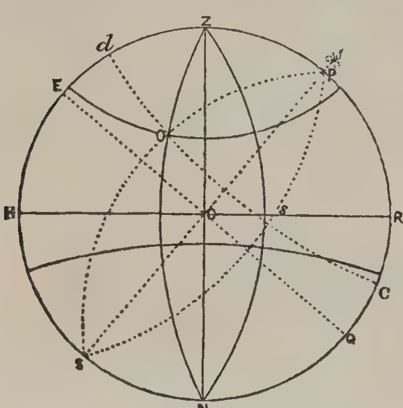


Fig. 2.

zenith of a place, ZHNR its meridian, P the north pole of the heavens; the other lines are then circles of declination, altitude, azimuth, and hour circles; and let O represent the place of the sun in given declination and altitude at a certain time. The instrument is now set by turning round the upper card till the point O (determined by its circle of declination and hour circle) on the under card falls upon the circle of given altitude on the upper card; then *d* is the sun's place at noon, H*d* being his meridian altitude, PR the latitude of the place, the angle RPS (measured in degrees along QE) the time of sunset, *ds* half the length of the day, *sc* half the length of the night, &c. The spherograph is also useful in finding latitude when the horizon is hid by fogs, right ascensions at night, and in correcting lunar observations; but for these purposes, spherographs are specially constructed, as some slight variations in the form given above are necessary.

SPHE'ROID is a species of Ellipsoid (q. v.), and is represented by the same equation. If an ellipse be made to revolve round one of its axes, the curved outline of the ellipse describes the spheroid. Should the major or longer axis be the axis of revolution, the spheroid is said to be *prolate* (Lat. *prolatus*, lengthened), but if the minor or shorter axis, *oblate*. The earth's axis of revolution which runs from pole to pole, being about 25 miles shorter than the longest or equatorial diameter, and these being at right angles to each other, the earth is considered as an oblate spheroid.

SPHEROI'DAL CONDITION of liquids is the name usually given to a series of very singular phenomena discovered by Leidenfrost, but first carefully investigated by Boutigny. Indeed, one, at least, of these phenomena has been popularly known for a very long time, being the foundation of the rough practical method of determining whether or not a flat-iron is so hot as to be likely to singe the linen to which it is to be applied. The test consists simply in letting a drop of water fall upon the iron; if it be not too hot, the drop spreads over the surface and evaporates. If it be too hot, the drop at once glances off the iron without wetting it.

The common experimental method of exhibiting the spheroidal condition is easily performed thus: A metallic disc, slightly concave, like a watch-glass, is heated by a lamp, and water is cautiously dropped on it from a pipette. If this be done before the disc is sufficiently heated, the water boils almost explosively, and is dispersed at once in vapour. But when the disc is hot enough, the water remains suspended, as shewn in the cut, *above* the surface; and the drop, when

small, takes nearly the form of an oblate spheroid. Various proofs have been given, though they are obviously unnecessary, that there is no contact in this case. Thus, if the disc be very nearly flat, light passes freely between it and the drop. Again, if one pole of a galvanic battery be connected with the disc, and the other be dipped into the drop, a galvanometer interposed in the circuit shews that no current passes. By heating the disc sufficiently, and dropping on the water very carefully, we may easily keep in the spheroidal state as much water as, if not more than, it could hold when cold. The explanation of the phenomenon is not yet quite clear; but there is no doubt that the radiant heat from the disc raises vapour so freely from the surface of the drop nearest it, as to interpose a cushion of dense and highly-heated vapour between them, on which the drop, as it were, floats; the pressure of the vapour balancing its weight. This is not, however, a quite complete explanation of the experiment, and it would require too much detail to examine it more closely. But the most curious fact connected with the experiment is, that the water does *not* boil. In fact, it evaporates so freely that the heat carried off from it, as latent heat, by the vapour which is constantly formed, keeps its temperature somewhere about 206° F. only. This suggests a curious experiment, which is found to succeed. *Boiling* water, dropped on a red-hot plate of metal, instantly assumes the spheroidal state, and is *cooled* six degrees below boiling.

It is not necessary that a metal plate be used—a watch-glass will suffice for the experiment; but *hot* water must be dropped on it, else the glass will crack.

Other liquids, and even some bodies which are solid at ordinary temperatures, can be easily brought into the spheroidal state—the lowest requisite temperature of the disc being dependent on the boiling point of the substance. Thus, while water has a temperature of 206° F. in the spheroidal state, the disc must have a temperature of 340° F. at least—for alcohol, these temperatures are 168° F. and 270° F.—for ether, 94° F. and 140° F. A good example of a solid entering this state is furnished by dropping crystals of iodine on a hot platinum disc.

It is not necessary that the disc should be solid; it is easy to obtain ether, and even water in the spheroidal state over the surface of hot oil—but

great care is required, as explosions are apt to occur, in which case the hot oil is freely thrown about.

Many cases of bursting of steam-boilers, otherwise apparently inexplicable, seem to be attributable to this condition of matter. Thus, if we suppose that the water-supply has run low, and the boiler has been overheated, it is conceivable that the contents may sometimes be in the spheroidal state. The addition of cold water, in such a case, would bring them suddenly *in contact with* the overheated metal, and large quantities of steam would be generated with violence.

A very singular experiment, the freezing of water on a red-hot plate, is easily performed by the help of this property of matter. Liquid sulphurous acid is so volatile as to have a temperature of 13° F. only, when in the spheroidal condition. As this is 19° under the freezing-point of water, if a little water be dropped into the spheroid of acid, it is at once frozen, and the pellet of ice can be dropped on the hand from the still red-hot plate.

Even mercury can be frozen by a similar process, but as much greater cold is required, the substance in the spheroidal state is a mixture of solid carbonic acid and ether.

The hand may be dipped for a short time with impunity into melted lead, and even into melted copper. The vapour, instantly raised from the moisture of the skin, prevents, so long as that moisture lasts, more than an endurable amount of radiant heat from reaching the hand, and also prevents direct contact. It is probable that a knowledge of some forms of this phenomenon, in old days, was employed by priestcraft for the purpose of protecting, when it was desirable to do so, the victims of the Ordeal (q. v.) by fire.

The phenomenon may easily be reversed. Thus, a red-hot silver ball, dropped into a vessel of water, is seen to glow for some time, till it has so far cooled, that the water comes into contact with it, when we have, as in the other form of the experiment, an immediate and violent formation of vapour. The success of this experiment is greatly aided by the addition of some strong ammonia to the water.

SPHINCTER MUSCLES (Gr. *sphinktēr*, that which binds tight) are circular bands of muscular fibres, whose function is to antagonise the expellent action of certain viscera, especially the bladder and the lower part of the intestinal canal. It is to the presence of these muscles that the higher animals owe the power of retaining for a considerable period the excrementitious matters collected in the bladder and rectum, and of discharging them at intervals, the sphincter muscles being like those engaged in the process of respiration, mainly, but not entirely under the control of the will. Under certain conditions, however, the necessity for expelling the contents of these viscera becomes so urgent that the sphincters lose their ordinary voluntary power.

SPHINX, a Greek word, signifying the Squeezer or Strangler, applied to certain symbolical forms of Egyptian origin, having the body of a lion, a human or an animal head, and two wings attached to the sides. Various other combinations of animal forms have been called by this name, although they are rather griffins or chimæras. Human-headed Sphinxes have been called androsphinxes; one with the head of a ram, a criosphinx; with a hawk's head, a hieracosphinx. The form, when complete, had wings added at the sides; but these are of a later period, and seem to have originated with the Babylonians or Assyrians. In the Egyptian hieroglyphs, the Sphinx bears the name of *Neb*, or Lord, and *Akar*, or Intelligence, corresponding to the account of Clemens, that these emblematic figures depicted intellect and force. The idea that they allegorised the overflow of the Nile when the sun was in the constellations Leo and Virgo, appears quite unfounded. In Egypt, the Sphinx also appears as the symbolical form of the monarch considered as a conqueror, the head of the reigning king being placed upon a lion's body, the face bearded, and the usual dress-drapery being suspended before it. Thus used, the Sphinx was generally male; but in the case of female rulers, the figure has a female head, and the body of a lioness.

The most remarkable Sphinx is the Great Sphinx at Gizeh, a colossal form, hewn out of the natural rock, and lying 300 feet east of the second pyramid. It is sculptured out of a spur of the rock itself, to which masonry has been

View of the Great Sphinx during the excavations of Caviglia, 1816.
From Colonel Vyse's *Pyramids of Gizeh.*

added in certain places, to complete the form, and measures 172 feet 6 inches long by 56 feet high. Immediately in front of the breast, Caviglia found, in 1816, a small naos, or chapel, formed of three hieroglyphical tablets, dedicated by the monarchs Thothmes III. and Ramesses II. to the Sphinx, whom they adore under the name of Haremakhu, or Harmachis, as the Greek inscriptions found at the same place call it—i. e., the Sun on the Horizon. These tablets formed three walls of the chapel; the fourth, in front, had a door in the centre, and two couchant lions placed upon it. A small lion was found on the pavement, and an altar between its fore-paws, apparently for sacrifices offered to it in the time of the Romans. Before the altar was a paved esplanade or dromos, leading to a staircase of thirty steps placed between two walls, and repaired in the reigns of M. Aurelius and L. Verus, on the 10th May 166 A.D. In the reign of Severus and his sons, 199—200 A.D., another dromos, in the same line as the first, and a diverging staircase, were made, while some additions were found to have been made to the parts between the two staircases in the reign of Nero. Votive inscriptions of the Roman period, some as late as the 3d c., were discovered in the walls and constructions. On the second digit of the left claw of the Sphinx, an inscription, in pentameter Greek verses by Arrian,

probably of the time of Severus, was discovered. Another metrical and prosaic inscription was also found. In addition to these walls of unburnt brick, galleries and shafts were found in the rear of the Sphinx, extending northwards. The excavations, however, of M. Mariette, in 1852, have thrown further light on the Sphinx, discovering the peribolos, or outer wall that encircled it; that the head only was sculptured; and that the sand which had accumulated round it was brought by the hands of man, and not an encroachment of the desert; also that the masonry of the belly was supported by a kind of abutment. To the south of the Sphinx, Mariette found a dromos, which led to a temple built, at the time of the fourth dynasty, of huge blocks of alabaster and red granite. In the midst of the great chamber of this temple were found seven statues, five mutilated and two entire, of the monarch Shaf-ra or Cephren, made of a porphyritic granite. They are fine examples of ancient Egyptian art. While the beauty and grandeur of the Great Sphinx have often attracted the admiration of travellers, its age has always remained a subject of doubt; but these later discoveries prove it to have been a monument of the age of the 4th dynasty, or contemporary with the pyramids.

Besides the Great Sphinx, avenues of Sphinxes have been discovered at Saqqarah, forming a dromos to the Serapeium of Memphis, and another dromos of the same at the Wady Esseboua. A Sphinx of the age of the Shepherd dynasty has been found at Tanis, and another of the same age is in the Louvre; and a granite Sphinx, found behind the vocal Memnon, and inscribed with the name of Amenophis III., is at St Petersburg. An avenue of criosphinxes has been found at Karnak. These are each about seventeen feet long, and of the age of Horus, one of the last monarchs of the 18th dynasty. Various small Sphinxes are in the different collections of Europe, but none of any very great antiquity.

The Theban Sphinx, whose myth first appears in Hesiod, is described as having a lion's body, female head, bird's wings, and serpent's tail, ideas probably derived from Phœnician sources, which had adopted this symbolical form into the mythology from Egypt. She was said to be the issue of Orthos, the two-headed dog of Geryon, by Chimæra, or of Typhon and Echidna, and was sent into the vicinity of Thebes by Juno, to punish the transgression of Laius, or, according to other accounts, by Bacchus, Mars, or Pluto. See Œdipus. The Sphinx was a favourite subject of ancient art, and appears in bas-reliefs, on medals of Chios and other towns, and often as the decorations of arms and furniture. In Assyria and Babylonia, representations of Sphinxes have been found, and the same are not uncommon on Phœnician works of art.

Birch, *Mus. of Classic. Antiquit.*, ii. p. 27; *Quarterly Review*, xix. p. 412; Vyse, *Pyramids*, iii. p. 107; Young, *Hieroglyphicks*, Pl. 80; Letronne, *Inscr. Grecq.*, ii. p. 460; *Rev. Arch.*, 1853, p. 715; 1860, p. 20; *Schol. Euripid.* i. 1, 1134; Hesiod, *Theog.*, 326; Creuzer, *Symbolik*, i. 495.

SPHINX. See Hawk-moth.

SPHYGMOGRAPH. See Supp. in Vol. X.

SPHYRÆ'NIDÆ, a family of fishes included by Cuvier in *Percidæ*, but having the ventral fins far behind the pectorals, and the bones of the pelvis quite detached from those of the shoulder. The form is elongated; there are two dorsal fins; the scales are small and cycloid; the mouth very large, with strong sharp teeth. The species are found in the Mediterranean and in tropical seas. Some attain a large size, as the Barracouda, or Barracouda Pike (*Sphyræna barracouda*), an inhabitant of the tropical parts of the Atlantic Ocean, which is scarcely less formidable than the White Shark. It is, however, held in considerable estimation as an article of food, but at some seasons of the year becomes unwholesome. It is a beautiful fish, of a rich green colour above, and white beneath. The Becuna (*S. vulgaris*) is also valued as an article of food, and its scales and air-bladder yield a substance used for making artificial pearls.

SPICCA'TO (Ital. separated), a musical term, indicative, like Staccato (q. v.), of a distinct and detached mode of performance. Its usual application is to music for bowed instruments, where it implies that each note is to have a bow distinct from that which precedes or follows it.

SPICE ISLANDS. See Moluccas.

SPICES (Lat. *species*, kinds; in later Latin, kinds of goods, or produce in general; and then, the most highly prized kind of goods, the aromatic productions of the East), aromatic and pungent vegetable substances, used as condiments and for flavouring food. They are almost exclusively the productions of tropical countries. In ancient times, and throughout the middle ages, all the spices known in Europe were brought from the east; and Arabia was regarded as the land of spices, but rather because they came through it, or were brought by its merchants, than because they were produced in it, for they were really derived from the further east. They owe their aroma and pungency chiefly to essential oils which they contain. They are yielded by different parts of plants; some, as pepper, cayenne pepper, pimento, nutmeg, mace, and vanilla being the fruit or particular parts of the fruit; whilst some, as ginger, are the root-stock; and others, as cinnamon and cassia, are the bark. Tropical America produces some of the spices, being the native region of cayenne pepper, pimento, and vanilla; but the greater number are from the East Indies.

SPIDER (*Aranea*), a Linnæan genus, now divided not only into many genera, but into many families, and constituting a section (*Araneida*) of the class *Arachnida*, and order *Pulmonaria*. The species are very numerous, and are found in all parts of the world, but most abundantly in tropical countries, which also produce the largest species, some of them capable of making very small birds, and not merely insects, their prey (see Bird-catching Spider). The *cephalothorax*, formed by the combination of the head and thorax into one piece, is covered with a kind of horny buckler, generally of an oval form; the abdomen is attached to it by a short stalk, and is generally soft and tumid. Each of the eight legs consists of seven joints, the last armed with two hooks, which are commonly toothed like a comb. The *frontal claws*, commonly called *mandibles*—which do not, however, correspond to the mandibles of insects, and move in an entirely different direction, up and down—are terminated by a sharp movable hook, which has near its extremity a small slit for the emission of a venomous fluid secreted in a gland of the previous joint. The *maxillæ* are two in number, and between them is an organ called the *tongue*, forming part of the external apparatus of the mouth. The maxillæ are the basal joints of the *palpi*, which resemble very small legs, and are often terminated in the females by a small hook, but in the males by complicated and curious appendages, characteristic of the different genera and species. Spiders have generally eight eyes, the relative position of which varies remarkably in the different families and

genera. A few species have only six eyes, and a very small number have only two. The upper surface of the abdomen generally exhibits a number of impressed spots, most conspicuous in those kinds which have a smooth naked skin. The pulmonary orifices are either two or four in number, and are situated near the base of the abdomen. Near the nus are several *spinnerets*, small protuberances,

Position of Spider when attached to a thread of web, and spinning apparatus highly magnified.

pierced at the extremity with a multitude of minute orifices, from which threads of extreme tenuity are produced, all these threads combining to form one thread of the *web*. The substance which exudes from the spinnerets is glutinous, and immediately dries into thread on coming in contact with the air. It is elaborated in reservoirs, which terminate in intestine-like tubes. All spiders have spinnerets, and produce threads, although all do not use them for the same purposes; for they differ very much in their habits: some employ their webs in order to catch their insect prey, whilst others depend for the capture of their prey on their powers of running and leaping; and some weave for themselves habitations, in which they live, whilst others select holes and crevices as their places of abode. Almost all spiders envelop their eggs in silken cocoons, which some of them tear open when the young are hatched; they are attentive to their young, some carrying them for a time on their back, whilst some carry the cocoons or egg-cases beneath their breast, and others carry them attached to the extremity of the abdomen. Nearly 2000 eggs have been found in a single cocoon, and the young, when set free, may be seen swarming over the body of the mother, so as almost to conceal her from view. The female S. is in many of the species, much larger than the male, and a very remarkable danger attends the amatory approaches of the latter, as, if they are not favourably received, he is not uncommonly killed and eaten on the spot. Spiders are very pugnacious, and in their combats often sustain the loss of limbs; but, like crustaceans, they possess the power of repairing this loss. Like them also, they change their skin frequently during their growth; but they undergo no proper transformation. There is much similarity of form among all the multitude of kinds. Many of them exhibit very brilliant and beautiful colours, among which are some of the British species, to be found in fields and moors, although the Common House S. (*Aranea domestica*) is of very unattractive appearance.

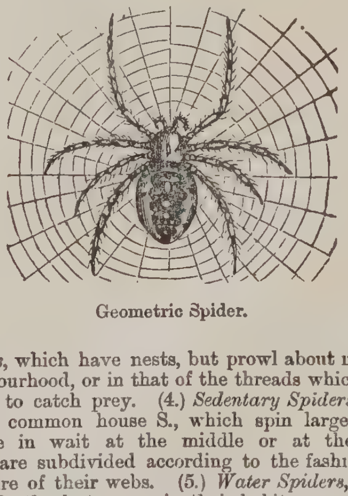
All spiders kill the insects and other small creatures on which they prey by means of their venomous mandibles, and the bite of a house S. is quickly fatal to a house-fly. The bite of the larger species is dreaded even by man, being very painful, and not only producing much inflammation and swelling but often much fever. Death has been known to ensue.

Spiders' webs have long been in high repute for staunching wounds. Threads of this material are also employed for the cross-wires of astronomical telescopes. Textile fabrics have been made of it, but only as articles of curiosity.

Spiders have been arranged by Walckenaer in five principal groups, distinguished by their habits. (1.) *Hunting Spiders*, which incessantly run about in the vicinity of their abode in quest of prey, some of them weaving silken tubes, in which they dwell, others hiding in fissures; some remarkable for the swiftness with which they run, others for their power of leaping in order to seize their prey. Some of them are of large size. Livingstone mentions a South African one which can leap a distance of one foot. A small one is common on windows in Britain in summer, and, when leaping, avoids the danger of falling from the window by suspending itself at the same moment by a thread. (2.) *Wandering Spiders*, which have no fixed residence, have the power of running sideways or backwards, and throw out threads to entrap prey, but do not weave them into

Various species of Spiders.

regular webs. Some of them live among plants, and place their egg-cases on leaves, the edges of which they bind together with their silk. (3.) *Prowling*



Geometric Spider.

Spiders, which have nests, but prowl about in their neighbourhood, or in that of the threads which they spread to catch prey. (4.) *Sedentary Spiders*, such as the common house S., which spin large webs, and lie in wait at the middle or at the side. These are subdivided according to the fashion and structure of their webs. (5.) *Water Spiders*, which resemble the last group in their habits, except that they live in water, generally among the stems and

eaves of aquatic plants, where they construct their webs. A very interesting species, one of the most interesting possible inmates of an aquarium, is the Common Water S. (*Argyroneta aquatica*) of Britain, not unfrequently to be found in deep ditches and ponds in some parts of England. It is of a brownish colour, densely covered with hairs, which are of great importance in its economy, entangling air, which the animal carries down with it into the water, to supply its pulmonary sacs; for the water spiders all breathe by the same kind of organs as their terrestrial congeners. The eggs of the water S. are attached to the leaves or stems of plants under the surface of the water, and are protected by a dome-shaped web, so close in its structure as to retain the air which is brought into it, and in which the S. itself lives, bringing down air on its furred body till the dome is filled. The entrance is from below.—Many of the nests of other kinds of S. are extremely curious structures, as that of the Clotho (q. v.), and that of the Trap-door S. (*Cteniza nidulans*) of the West Indies, which makes for itself a

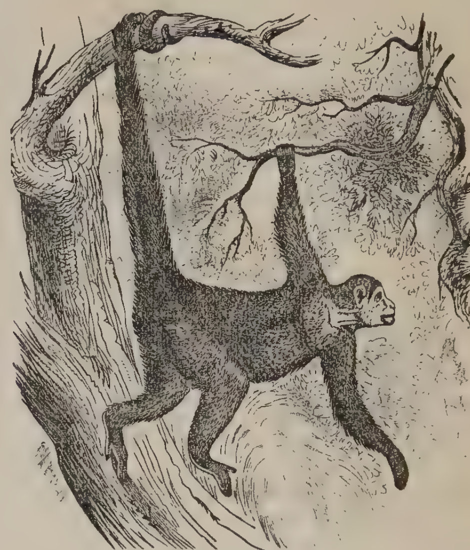
Trap-door Spider (*Cteniza nidulans*):

1, nest with trap-door closed; 2, section of nest; 3, spider emerging at the trap-door.—Copied from the Rev. J. Wood's *Homes without Hands.*

burrow in the ground, lines it with silk, and places at the mouth a perfectly circular door made of alternate layers of earth and web, fitting the entrance exactly, and with a silken hinge.

SPIDER FLY (*Ornithomyia*), a genus of dipterous insects, closely allied to the Forest Fly (q. v.), but the claws of the tarsi having three instead of two teeth; and the species are parasitical on birds, never on quadrupeds. *O. avicularia* frequently infests the common fowl, the blackcock, and other birds in Britain. It is greenish-yellow, with smoke-coloured wings.

SPIDER MONKEY, a name often given to species of the genus *Ateles*, small American monkeys, on account of their very long, slender, inelegant limbs. The tail is very long, and not only prehensile in the highest degree, but endowed with a wondrous sensitiveness of touch. These monkeys display great intelligence. It is their common practice to break nuts by means of stones; and a tame one which Dr Gardner carried with him in his travels in Brazil, used to try a larger stone, if the first did not serve its purpose, and even to take it up in both paws, and dash it upon the nut, jumping quickly out of the way to avoid injury to its own toes. This animal generally rode on the back of a large mastiff and in descending a steep hill, would curl its tail



Spider Monkey.

round the root of the mastiff's tail, to make its seat secure.

SPIGE'LIA, a genus of plants of the natural order *Loganiaceæ*, having a calyx glandular inside, a long slender valvate corolla, long filaments, and a capsule of two *cocci*, splitting around at the base.—*S. Marilandica*, often called WORM GRASS and CAROLINA PINK, is a native of the southern United States of America, a perennial plant with a simple quadrangular stem. The root (PINK ROOT) is purgative, narcotic, and poisonous, but is a powerful vermifuge, and is very commonly employed in the United States.—*S. Anthelmia*, an annual, native of tropical America, with very small purplish flowers, in spike-like racemes, possesses similar properties. The efficacy of both is, however, impaired by keeping; and they are apt to produce unpleasant symptoms when used as medicines. Other species are also known as poisons.

SPIKE, in Botany, that kind of inflorescence in which sessile flowers, or flowers having very short stalks, are arranged around an axis, as in the greater plantain, common vervain, common lavender, and some species of sedge. In rye, wheat, barley, darnel, and many other grasses, there is a sort of compound spike, that is, the flowers or fruits are arranged together in spikelets, upon short stalks, which again surround the top of the culm in the form of a spike. The catkin, the spadix, and the cone may be regarded as varieties of the spike.

SPI'KENARD, or NARD (Gr. *Nardos*), a perfume highly prized by the ancients, and used both in baths and at feasts. It was brought from India and was very costly. The 'ointment of spikenard' (John xii. 3) was probably an oil or fat, impregnated with the perfume. The plant which produces it has been ascertained by the researches of Sir William Jones and Dr Royle to be the *Nardostachys jatamansi*, the Jatamansi of the Hindus, a small plant of the natural order *Valerianaceæ*, a native of the mountains of the north of India, and found at least as far south as the Deccan

It grows on the Himalaya to an elevation of 18,000 feet, and its roots are a favourite perfume in Tibet and Nepaul. The ladies of Nepaul use oil in which the root has been steeped for perfuming their hair. The odour is not, however, generally agreeable to Europeans. The root, which is from three to twelve inches long, sends up many stems, with little spikes of purple flowers, which have four stamens.—The name spikenard was given by the ancients to perfumes used as substitutes for the true or Indian spikenard, some of which were derived from the roots of plants of the same natural order, the kind called Gallic or Celtic spikenard from those of *Valeriana Celtica* and *V. saliunca*, which are still used in the East for perfuming baths; and that called Cretan spikenard from those of *V. Italica*, *V. tuberosa*, and *V. phu*. All of these grow on the Alps and other mountains of the south of Europe, and the peasantry of Styria and Carinthia collect them from rocks on the borders of perpetual snow. They are tied in bundles, and sold at a very low price to merchants, who sell them at a great profit in Turkey and Egypt, from which they are partly transmitted even to India. About sixty tons are annually exported from Trieste.

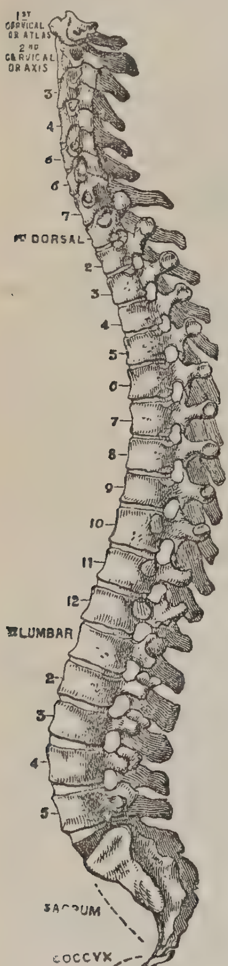
SPIKING is the operation of rendering a cannon useless without the expenditure of much time and labour. It is resorted to by troops compelled to abandon their own ordnance, or unable to remove pieces of the enemy's which they have captured. The process consists in driving a nail or spike into the vent or touchhole. To remove it, it is recommended, if an iron gun, to load with double charge and double balls, and to fire by a train laid through the muzzle. This is supposed to loosen the spike. If the gun be of brass, a few drops of sulphuric or nitric acid on the touchhole will render it practicable to extract the spike. If these methods fail, nothing remains but the tedious process of drilling out the spike or boring a new vent.

SPI'NA BI'FIDA is a congenital malformation, occurring perhaps more frequently than any other except hare-lip, and arising like it from arrest of development. It may be regarded as a congenital hernia of the membranes of the spinal cord, through a fissure in the wall of the bony canal. A tumour is thus formed, which is usually of a roundish shape, varying in size from that of an egg to that of an adult head, lying in the middle line of the back, fluctuating, and adhering to the adjacent vertebræ either directly or by a pedicle. The usual termination of the disease is death. As the size of the tumour increases, fatal convulsions ensue; or the skin investing the tumour may ulcerate, and the contents escape, in which case palsy or convulsions produce death. Occasional cases are, however, recorded in which patients with this affection have survived till middle life. Active surgical treatment usually hastens death, and should only be resorted to in the most urgent circumstances. Moderate support by means of a hollow truss, or a well-padded concave shield, may tend to keep the disease stationary; and any interference beyond this is, in the great majority of cases, unadvisable.

SPI'NACH, or **SPINAGE** (*Spinacia*), a genus of herbaceous plants, of the natural order *Chenopodiaceæ;* diœcious, the male flowers consisting of a 4-parted perianth and four stamens; the female, of a 2—3-cleft perianth, and a germen with four styles; the perianth hardening around the fruit as it ripens; the fruit an achenium. COMMON S., or GARDEN S. (*S. oleracea*), is in general cultivation for the sake of its young leaves, which are a favourite and wholesome vegetable, either prepared by boiling, or by frying with a little butter. Two very distinct varieties are cultivated.—PRICKLY S., which has the leaves somewhat triangular and arrow-headed, and the fruit rough with prickle-like projections; and SMOOTH S., or ROUND S. (*S. glabra* of some botanists), with the leaves more round and blunt, and the fruit smooth. S. is an annual. Its stem rises to the height of from two to four feet; the male flowers are in long spikes, the female in clusters close to the stem. After the stem begins to be developed, the leaves become bitter, and unfit for use. This bitterness appears also at an earlier period in dry weather, or in poor soil; and the more luxuriantly that S. grows, the better it is. It is sown in spring, and is ready for use in a very short time; or it is sown in autumn, thinned out, and used early in spring. The smooth S. is very generally preferred for the former purpose, and the prickly kind for the latter; but a somewhat intermediate variety, called Flanders S., is now often used for both, being particularly esteemed for the large size of its leaves. The native country of S. is not well known, but is believed to be some part of Asia, as the plant was introduced by the Arabs into Spain, and thence diffused over Europe.—Another species (*S. tetrandra*) is cultivated, and much esteemed, in India.—The name S. is also given to a number of other plants of very different botanical characters, but which have the same bland and nutritious qualities, and are used in the same way.—NEW ZEALAND S. is *Tetragonia expansa*, a plant of the natural order *Mesembryaceæ*, suborder *Tetragonieæ* (nat. ord. *Tetragoniaceæ* of Lindley), a trailing, succulent annual, spreading widely over the surface of the ground, and producing a great abundance of stalked ovate-rhomboid leaves. The young stems and leaves of this plant are much used in New Zealand, and have now come into very general use also in other parts of the world, as a kind of spinach. It is cultivated in the middle and south of Europe and in Britain, succeeding well even in Scotland with the slightest aid of a hotbed in spring.—PATIENCE DOCK, or GARDEN PATIENCE (*Rumex Patientia;* see DOCK) is called in Germany ENGLISH S., and was formerly much cultivated in England, but is now neglected.

SPINAL COLUMN, or **SPINE**, THE, is the most important and characteristic part of the skeleton of the highest animal sub-kingdom, which includes Mammals, Birds, Reptiles, Amphibians, and Fishes. In each of these classes, it is composed of a series of bones placed one above, or in front, of another, and called Vertebræ (q. v.); and hence, these animals, having this distinguishing characteristic in common, are all included in the term *Vertebrates*. The vertebræ vary greatly in number in different animals, and even in members of the same class, and the number have no apparent relation to the other organs of the animal. Moreover, in their shape, they differ extremely even in different parts of the same spine, in accordance with their special functions. In man, the number of vertebræ which collectively form the spinal column is 7 in the neck (cervical vertebræ), 12 in the back (dorsal vertebræ), 5 in the loins (lumbar vertebræ), all of which are capable of being detached from one another, and are termed *true* vertebræ; and 5 vertebræ ossified together, and forming the sacrum, and 4 or 5 similarly united forming the termination of the column, and constituting the bone called the coccyx, which are known as *false* vertebræ. However long or short the neck may be, every mammal has 7 cervical vertebræ, excepting the three-toed sloth, which has 9, and the sea-cow, which has 6. In the other regions of the spine, no such law exists. Each vertebra is attached to the two between which it

lies by numerous strong and more or less elastic ligaments, and between each pair of vertebræ there is interposed a lenticular disc of fibro-cartilage, which acts as a buffer. By these arrangements, the spinal column is rendered highly elastic, the communication of jars or shocks is prevented, and a very considerable general range of movement permitted, although the motion between any two adjacent vertebræ is slight. The elasticity of the column is further increased by the component vertebræ being arranged in curves, instead of being placed perpendicularly. The curves should be exactly in the antero-posterior direction, any well-marked lateral deviation from the perpendicular being abnormal; but a very slight lateral curvature with the convexity to the right may often be detected in the upper and middle parts of the back, and is supposed to be dependent on the more frequent use and greater strength of the right arm as compared with the left. From their position, they are termed the cervical, dorsal, lumbar, and pelvic curves. The dorsal and pelvic curves have their concavities in front, and thus enlarge the spaces in which the thoracic and pelvic viscera are contained; the two other curves are convex anteriorly, and thus afford support to the parts above them. The upper three curves are so arranged that their chords are in the same vertical line in the erect position of the body, and this vertical line corresponds with the line of gravity of the head. The cause of these curves is to be sought for partly in the shape of the vertebral bodies, and partly in that of the intervertebral substance. Amongst the uses of these curves, it may be mentioned (1) that they enable the spine to bear a greater vertical weight than it could otherwise maintain; it is calculated that nine times as great a vertical force is required to bend it as if it had been straight; (2) that they facilitate the movements of the body, especially in the act of running; and (3) that they are so disposed as to protect the cord in movements of the spine. Similar curves are seen in the spine of other mammals, though the degree of flexure is liable to great deviations. The lumbar curve, which has especial reference to the erect position, is always much less marked than in man.



Spinal Column.

The vertebral canal formed by the apposition of the spinal foramina, or neural arches (see SKELETON), and containing and protecting the spinal cord, varies in its size at different parts of the column. It is largest in its antero-posterior diameter in the neck and loins (measuring at the last lumbar vertebra ⅞ths of an inch), where the antero-posterior movements of the spine are greatest, and where the cord is least closely attached to the vertebræ; while in its lateral diameter it is greatest at the atlas, where it measures nearly an inch and a half. A transverse section of the canal is nearly circular through the greater part of the back. The intervertebral foramina through which the nerves emerge vary in shape and position in different parts, but are always of sufficient size to prevent injurious pressure on the nerves during movement of the spine; and in the dorsal region, which is the ordinary seat of angular curvature, the nerves are so protected by bony arches, that they may escape injury, even when the bodies of several dorsal vertebræ have been destroyed by ulceration.

SPINAL CORD OR MARROW, THE STRUCTURE AND FUNCTIONS OF. The spinal cord is that elongated part of the cerebro-spinal axis (see NERVOUS SYSTEM) which is contained in the spinal canal from the *Foramen magnum*, at the base of the skull, superiorly, to the first or second lumbar vertebra inferiorly, where it merges into the *Filum terminale*, which extends to the lower end of the sacral canal, and in no way differs structurally from the proper spinal cord, except that no nerve-roots are connected with it. The membranes by which it is protected from danger, and kept in its proper position, are described in the article NERVOUS SYSTEM. Its length varies from 15 to 18 inches, and it presents a difference in its diameter in different parts, there being an upper or cervical, and a lower or lumbar enlargement. In form it is a flattened cylinder. It is almost completely divided, along the median plane, by an anterior and posterior fissure, into two equal and symmetrical parts. The anterior fissure is more distinct and wider at the surface than the posterior fissure, but it only penetrates to about one-third of the thickness of the cord, while the posterior fissure extends to about half the thickness of the cord. The two halves are hence only united near the centre by a commissural band, which is traversed by the 'spinal canal' (fig. 2, *f*), extending downwards from the fourth ventricle (see BRAIN), and about one-hundredth of an inch in diameter. A posterior and an anterior lateral furrow (two shallow depressions, the latter being scarcely perceptible) further divide each half of the cord into a posterior, a lateral, and an anterior column; these two furrows corresponding with the lines of attachment of the posterior and anterior nerve-roots. The separation of the antero-lateral columns into the 'anterior' and the lateral columns (A, A, and L, L, in fig. 2), is made more obvious internally by the mode in which the gray or vesicular nervous matter (described and figured in the article NERVOUS SYSTEM) is arranged in relation

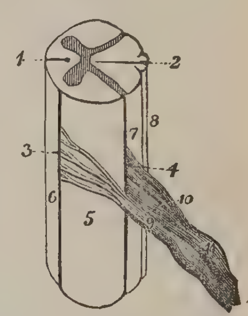


Fig. 1.—Side View of the Spinal Cord, shewing the Fissures and Columns.

1, anterior median fissure; 2, posterior median fissure; 3, anterior lateral fissure; 4, posterior lateral fissure; 5, lateral column; 6, anterior column; 7, posterior column; 8, posterior median column; 9, anterior root; 10, posterior root; and 11, ganglion of (12) a spinal nerve.—From Gray's *Human Anatomy*.

to the white or fibrous matter. Although the distribution of the gray matter differs considerably in different parts of the cord, it usually presents in a transverse section the form of two somewhat crescent-shaped masses, whose convexities are turned towards each other, and are connected by the gray commissure, while their cornua are directed towards the surface of the cord; the posterior peak on each side nearly reaches the posterior lateral furrow, while the anterior, though the larger cornu, does not approach quite so near

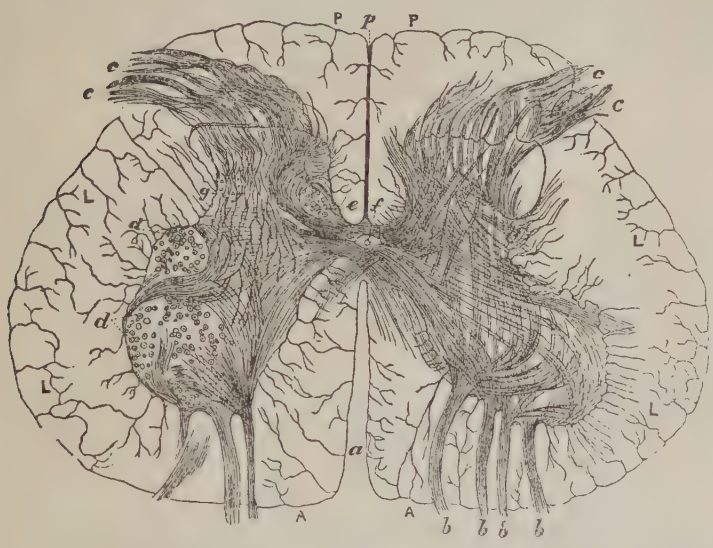


Fig. 2.—Magnified View of Transverse Section of the Spinal Cord through the middle of the Lumbar Enlargement: shewing, on the right side, the course of the Nerve-roots, and on the left, the position of the principal tracts of Vesicular Matter.

A, A, anterior columns; P, P, posterior columns; L, L, lateral columns; *a*, anterior median fissure; *p*, posterior median fissure; *b*, *b*, *b*, *b*, anterior roots of spinal nerves; *c*, *c*, *c*, *c*, posterior roots; *d*, *d*, tracts of vesicular matter in anterior column; *e*, tracts of vesicular matter in posterior column; *f*, spinal canal.—After J. L. Clarke.

the surface at the assumed anterior furrow. The enlargement of the cord in the cervical and lumbar region, where the great nervous plexuses are given off, is chiefly due to the increase, at those points, of gray matter, which is comparatively deficient in the interval between them. The white substance seems to increase regularly from the lower to the upper part of the cord; and this fact, as Dr Carpenter remarks, seems to indicate the probability that the longitudinal columns serve (as formerly supposed) to establish a direct connection between the encephalic centres and the roots of the spinal nerves. Careful microscopic investigation has revealed the fact, that the root-fibres of the spinal nerves run two very distinct courses in the substance of the cord; the first *transverse*, and the second *longitudinal*. The transverse fibres traverse the cord horizontally or obliquely, and appear to pass out in the other sets of roots connected with the same segment, either on its own or on the opposite side of the median fissure; while the longitudinal fibres in part connect the posterior roots directly with the posterior column without passing into the vesicular matter, but for the most part enter the gray matter, and emerge from it into the posterior column, or into the posterior part of the lateral column of the same or the opposite side. How far these longitudinal fibres run up or lown the cord, is undecided. It is probable that *some* of them are longitudinal commissures, serving to connect the nerve-roots of one segment of the cord with the vesicular matter of another above or below it, and it is possible that *all* are of this character, in which case the spinal cord will be the real centre of all the nerve-fibres connected with it.

In considering the functions of the spinal cord, we have to regard it in two distinct points of view—viz., in the first place, as a *conductor* of nervous force between the nerve-trunks and the brain; and in the second place, as an *independent nervous centre*. As a mere *conductor* of nervous force, its functions and behaviour are the same as those of a nerve-trunk; for, as Dr Carpenter observes, 'if it be divided, all the parts of the body which are solely supplied by nerves coming off below the point of section are completely paralysed, as far as regards sensibility and voluntary movement; no impressions made upon them having the least power to affect the consciousness, and no exertion of the will being able to determine contraction of the muscles. This state of *paraplegia*, which may be experimentally induced in animals, is frequently exhibited in man, as a result of injury or of disease that seriously implicates the spinal cord; and as it has been shewn that among the lower animals complete reunion of the cord may take place after complete division, as indicated by the entire restoration of its functional powers, and the complete redintegration of its structure, so have we reason to believe that a similar regeneration may take place, to a considerable extent, in man, this being marked by a gradual return of sensibility and power of voluntary movement in the lower limbs, which had been at first completely paralysed.'—*Human Physiology*, 6th ed., pp. 529, 530. There can be little doubt that the gray matter is essentially the conductor of *sensory* impressions, for if the anterior, posterior, and antero-lateral columns are divided as completely as possible, the gray substance remaining uninjured, the sensibility of the parts below is unaffected; while, conversely, if the gray substance is divided, while the white columns remain uninjured, sensibility is almost totally extinguished. M. Brown-Séquard, whose researches on the nervous system are of the highest importance, has shewn that the central portions of the gray substance are the most effective in the transmission of sensation. He likewise brings forward strong evidence to prove that there are special conductors in the spinal cord for the sensations of touch, pain, temperature, and muscular contraction, none of which can convey other sensations than their own. Notwithstanding its singular power of conducting sensory impressions, the gray substance is itself insensible. Amongst his other remarkable discoveries in connection with this subject, Brown-Séquard has found, that on dividing one-half of the spinal cord of an animal, not only is

anæsthesia (or loss of sensation) established on the opposite side of the body, but there is also produced a state of hyperæsthesia (or exalted sensibility) on the same side, which begins to appear a few hours after the operation, and continues in dogs for about 20 days, in cats about 14 days, and in guinea-pigs for many months, after which the sensibility falls below its usual standard. With regard to the conduction of *motor* impulses, there is great uncertainty. Considerable differences have been shewn to exist in the position of the motor tracts in different parts of the cord, and Brown-Séquard concludes from his experiments on the effects of section, that while in the dorsal region, all parts, except the posterior columns, are employed in the conveyance of the orders of the will to the muscles, in the upper part of the cervical region, most of these conductors are in the lateral columns and in the gray substance between these and the anterior column.

We have now to consider the spinal cord as an *independent nervous centre.* The simplest, and, at the same time, the most decisive evidence of the independent power of the spinal cord, is derived from the motion exhibited by the limbs of animals when irritation is applied to them after section of the cord at some point above the entrance of their nerves; the fact that these movements are reflected through the cord, and do not result from direct stimulation of the part irritated, being shewn by their complete cessation when the nerve-trunks are divided. Thus, if a frog be pithed by dividing the cord between the occipital foramen and the first vertebra, an unusual convulsion takes place while the knife passes through the nervous centre; but this quickly subsides, and if the animal be placed on the table, it will resume its ordinary position. It is quite unable to move by any voluntary effort; but if a toe be pinched, the limb is instantly drawn up, and seen to push away the irritating agent, and then draw up the leg again to the old position.

From these and other experiments, we may conclude (1) that the spinal cord, *in union with the brain,* is the instrument of sensation and voluntary motion to the trunk and extremities; and (2) that the spinal cord may be the medium for the excitation of movements, *independently* of volition or sensation, either by direct irritation of its substance, or by the influence of a stimulus conveyed to it from some surface of the trunk or extremities by its nerves distributed upon that surface.—For further information on this subject, the reader is referred to Todd and Bowman's *Physiological Anatomy and Physiology of Man,* 2d ed., vol. i. pp. 255—260, and 307—341; and Carpenter's *Human Physiology,* 6th ed., 1864, pp. 491—500, and 519—538.

SPINA'ZZOLA, a city of Southern Italy, province of Terra di Bari, 7 miles south of Minervino. Pop. 9924. The country around is very fertile, and produces grain in abundance.

SPINDLE TREE (*Euonymus*), a genus of plants of the natural order *Celastraceæ.* This order contains about 260 known species, all small trees or shrubs. —The genus *Euonymus* has a lobed capsule, and seeds surrounded by an aril, which in some of the species is remarkable for its brilliancy of colour. The Burning Bush, or Waahoo (*E. atropurpureus*), a native of the United States, chiefly of the northern parts, and the *E. Americanus,* or Strawberry Bush, of more southward regions, are very ornamental when in fruit, and the aril is of a fine orange colour. They are shrubs rather than trees. The wood of the *E. Europæus* is hard and fine-grained. It is used for the finer articles of turnery, and for skewers. It was formerly used for making musical instruments and for spindles, whence the name of the shrub. In Germany, the shoots are bored for tubes of tobacco-pipes.

SPINE, or THORN, in Botany, is a sharp-pointed projection of the wood of a stem or branch, and essentially differs from a Prickle (q. v.) in being connected with the wood, and covered with bark. A spine is, in fact, a branch arrested in its growth and modified. In some trees and shrubs, as in the sloe, branches which bear leaves often terminate in the form of a spine. Cultivation, or whatever tends to increase the luxuriance of a plant, diminishes the tendency to produce spines. The name spine is also given to the sharp extremities of the midrib of leaves, and to the sharp angular projections of the margin of hard leaves, as in the holly. In some plants, the stipules are metamorphosed into spines.

SPINE, CURVATURE OF THE. There are two perfectly distinct forms of curvature, viz., LATERAL CURVATURE—arising from weakness of the bones, ligaments, and muscles, and fearfully common in girls of the middle and upper classes, between the ages of 10 and 16—and ANGULAR CURVATURE (frequently known as POTT'S CURVATURE, or the MALADY OF POTT, in consequence of that eminent surgeon having been the first to describe its true nature), which consists of caries of the bodies of the vertebræ, and is by far the more serious affection of the two.

'*Lateral Curvature,* or *Distortion,* denotes deformity of the bones of the spine and chest; with corresponding change of the structures in relation to them. It is called "lateral," from the spine being curved sideways; and to distinguish it from "angular" deformity, in which the spine is directed from behind forward, owing to excavations in its forepart from caries.' The above definition is taken from Mr Shaw's article on this affection in Holmes's *System of Surgery,* vol. iv. p. 844, an article from which we have borrowed freely in relation to the symptoms and causes of the disease. The first thing that commonly attracts attention is a projection of one scapula, or an elevation of one shoulder, generally the right; the right shoulder and right side of the chest being unnaturally high and rounded, while on the left side, the shoulder is depressed, and the side of the chest concave. On examination, the spine is found to have acquired a spiral appearance, 'not unlike what might have been produced if it had been taken, when soft, at both ends by the two hands, and twisted as a washerwoman wrings a wet cloth.'—Shaw, *op. cit.* In advanced stages of the distortion, the dorsal curve increases abruptly to such an extent as to render it angular, the attending contortion being similarly abrupt. This condition gives rise to various changes, including a *humped* appearance, a great displacement of the ribs, a diminution of the cavity of the chest, and a proportionate wasting of the lung. In consequence of these physical changes, the patient can no longer walk in a simple and natural manner, but exhibits a halting, jerking, awkward gait.

The following may be noticed amongst the principal causes of lateral curvature: 1. The suppleness of the spine in the young, its structure being then more gristle than bone, and the column virtually immature. 2. Weakness of the muscles, which are seldom properly exercised in girls of the age and class in which this disorder occurs. This muscular debility is usually followed by deterioration of the bones and their ligaments, and this, apart from other obvious and direct bad effects, tends to make all the component parts of the spine —vertebræ and articulations—more prone to yield to the superincumbent weight, and to become

distorted. These evil results are increased by prolonged stooping. When we enter a school, shortly before the breaking up of the class, we usually find most of the pupils standing or sitting in a tired lounging position. They are instinctively relieving the pain of over-fatigue by throwing the weight on the insensible fibrous structures, and thus relieving the aching muscles. When such attitudes are long indulged in, the ligaments undergo a process of over-stretching, and a general looseness of the vertebral joints is the result. By standing on one leg, or, more correctly speaking, by throwing all the weight of the body on one foot, the body is kept upright with the least possible expenditure of muscular power. Hence, a weak and fragile girl is induced to adopt this position. Too long indulgence in this habit will, to a certainty (for anatomical reasons, into which we have not space to enter), aggravate existing curvature, and induce it, if it did not pre-exist.

However slight a curve in the spine of a young girl may be, it ought to be deemed of importance; for when the column inclines laterally even to a slight degree, the superincumbent weight ceases to be supported on the line of the vertical axis, and falls on the oblique processes of the side to which she leans; and these processes becoming rapidly diminished in length by absorption, induced by this abnormal pressure, general distortion rapidly commences. With regard to the final issue of a case, distortion beginning at the age of ten is more dangerous than at fourteen, because the disease runs a more rapid course in the younger cases. A cure is, for the same reason, more easily effected in the younger patient. If the patient's age be beyond sixteen, little can be done beyond checking the further progress of the deformity.

Before discussing the treatment of these cases, it is necessary to say a word regarding an important preventive measure. When a girl is defective in muscular power, disinclined to take exercise, and prone to distortion of the spine, the sitting position does not afford her rest, in consequence of the great efforts she has to make in order to keep the body erect. A patient in that condition will derive benefit from being obliged to lie for two or three hours daily, at divided intervals, on a sofa or board. When the deformity has actually occurred, gymnastic exercises suggested by the medical attendant will not unfrequently, when continued for some time, have the effect of loosening the connection of the bones, of facilitating their falling into their proper places, when extension is employed, and of restoring to the spine a portion of its lost suppleness. Mr Shaw suggests the following simple plan for attaining the same end. 'Let the patient lie on one side, with a firm cylindrical pillow, six inches in diameter, placed under the gibbosity of that side, and let her rest her weight on the pillow: the effect will be to counteract and reverse the curve. The same may be done alternately on the two sides. The posture may be continued each way for a quarter of an hour at a time, and be repeated twice or thrice daily.'—*Op. cit.*, p. 858. There are two methods of extending the curved spine—viz. (1), by stretching the body while the patient is recumbent; and (2) by letting the patient remain upright, and using spinal supports. As each method has its own advantages, a combination of them will often afford the best results. The chief objections to the former are the necessary confinement, comparative seclusion, and interference with the routine of study. Any mode of treatment with the view of producing extension of the spine must be continued for months in order to be of any avail. It would be altogether out of place to notice in this article the various extending beds, apparatuses for exercise, and different kinds of spinal supports that have been devised by surgeons and anatomical mechanicians, and we will merely observe that mechanical supports must be tried with great caution. They are always more or less irksome to bear, and if they are not doing good, are almost sure to be doing harm. On this subject, the reader may consult Heather Bigg's work entitled *The Spine and Upper Extremities.*

Angular Curvature consists, as already mentioned, of caries of certain vertebræ, which first consumes the bones and fibro-cartilages, and subsequently excites a discharge of pus. The first symptom of this affection is the appearance, at the seat of the caries, of a prominence of one or more of the spinous processes. This 'growing out' of the back, as patients frequently term it, is due to the destruction of a portion of the column. In an advanced stage, the spinal ridge will stand out prominently, the knob of each process being distinctly visible; and finally, a distinct angular projection is developed. The *consequences* of this disease are thus summed up by Druitt. '1. In favourable cases, the diseased bones collapse, and are anchylosed; abscesses, if they form, are healed, or their matter is absorbed, and the patient recovers in two or three years, with more or less deformity, which is, of course, incurable. 2. In some fatal cases, the patient dies suddenly from two or three of the diseased vertebræ giving way, and crushing the spinal cord; or from dislocation of the odontoid process, owing to ulceration of its ligament; or from the bursting of abscesses into the spinal cord; or from their bursting into the pleura or peritoneum; but more frequently death is caused by slow irritation and exhaustion, consequent on the formation of psoas or lumbar abscesses.'—*The Surgeon's Vade-mecum*, 8th ed., p. 348. The most essential point in relation to *treatment* is *rest*, and the most effectual method of arresting motion between the diseased vertebræ, and of keeping them at rest, is by placing the patient in a recumbent position on his back. If possible, an invalid bed should be procured, provided with contrivances for enabling him to lie upon it, day and night, without rising. Local counter-irritants, such as compound tincture of iodine, are often useful; and good diet, backed, if necessary, by cod-liver oil and tonics, must be prescribed. In conclusion, sufferers from any form of real or suspected spinal disease are earnestly warned to avoid the numerous quacks, whether in or out of the medical profession, who have taken up the spine as a specialty.

SPI′NEL, a mineral allied to corundum, consisting chiefly of alumina, with smaller proportions of magnesia, silica, and protoxide of iron. It occurs in crystals, which are often octahedral, and is chiefly found in Ceylon and Siam. Its colours are various; red, blue, green, and black. It is much prized as a gem; red spinels are commonly called rubies; the *Balas Ruby* is a rose-red S., and a violet-coloured S. is known as *Alamandine Ruby.*

SPI′NET (Ital. *spinetta*) an old-fashioned stringed musical instrument with a keyboard, smaller and weaker than the harpsichord, and like it, one of the precursors of the pianoforte. Each note had but one string, which was struck by a quilled jack acted on by one of the finger-keys. The strings were placed horizontally and nearly at right angles to the keys, as in the square pianoforte; and the general outline of the instrument nearly resembled that of a harp laid in a horizontal position, with the keys occupying the position of the sounding-board; on which account the spinet, when first introduced, was called the couched harp.

SPINNING is the art of combining animal and vegetable fibres into continuous threads fit for the processes of weaving, sewing, or rope-making. The most primitive spinning apparatus is the spindle and distaff, representations of which are to be seen on the earliest Egyptian monuments. The distaff was a stick or staff upon which a bundle of the prepared material was loosely bound, and which was held in the left hand or stuck in the belt; the spindle was a smaller tapering piece to which the thread was attached. By a dexterous twirl of the hand the spindle was made to spin round and at the same time recede from the spinster, who drew out between the forefinger and thumb of the right hand a regular stream of fibres so long as the twisting of the spindle lasted. It was then drawn in, the new length of thread wound upon it, and the operation was renewed. An obvious improvement on this was to set

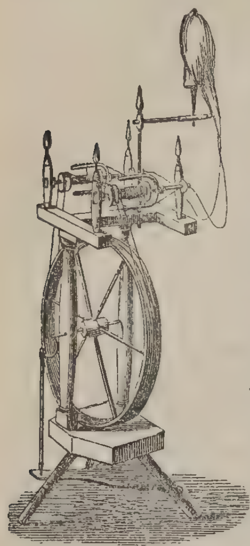


Fig. 1.—Two-handed Spinning-wheel.

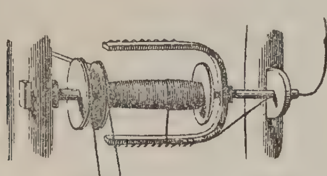


Fig. 2.
Spindle, Bobbin, and Winding-arm on a larger scale.

the spindle in a frame and make it revolve by a band passing over a wheel driven either by occasional impetus from the hand or by a treadle; this constituted the *spinning-wheel*, which is said to have been invented in Nuremberg as recently as 1530. In the spinning-wheel in its most improved form, and as used for flax, a bobbin or 'pirn,' with a separate motion, was placed on the spindle, which had a bent arm—a flyer or flight—for winding the yarn on the bobbin. The spindle and bobbin revolved at different rates, the revolutions of the spindle giving the twist, and the difference of the rate causing the winding on. The two-handed wheel had two spindles and pirns a little apart, with the distaff or 'rock' stuck into the frame between them, and the spinster produced a thread with each hand. The spinning of flax on such wheels for the manufacturer was an important branch of domestic industry in the northern counties of Scotland as late as 1830, if not later.

Neither the spinning-wheel nor the hand could spin more than one, or at most two threads at a time, and therefore with the rapid increase of population, and the improvements made in the process of Weaving (q. v.), they became quite inadequate to supply the demand for yarn: but an accident, it is said, about the year 1764, led to an invention by which eight threads could be spun at once; and this was soon improved upon until eighty could be produced as easily. This was the invention of the *spinning-jenny* for cotton-spinning, by James Hargreaves, at Standhill, near Blackburn in Lancashire. In this machine, a number of large reels of cotton formed into a thickish coil, called a *roving*, were set on upright fixed spindles, and the ends of the rovings were passed between two small movable bars of wood placed horizontally and under the control of the spinner, who could thus make them press more or less on the roving, and consequently increase or decrease the draw upon it from the spinning spindles, which were set in a row at the other end of the frame, and all capable of being set in motion simultaneously by the wheel. The success of the spinning-jenny (fig. 3) was considerable, but its history has been too often told to be required here; and even previous to its invention, a better idea had been started and acted upon by others, and was afterwards brought to such perfection, that the invention of Hargreaves soon passed into obscurity.

In order to understand the operations of spinning as now practised, and as improved by the invention alluded to, it is desirable, in this place, to say a few words upon the preparation of the fibres for the process of spinning. In the first place, if wool or cotton, it has to be 'opened;' that is, it must be relieved from its original knotted and lumpy condition; this was formerly done by hand, but is now easily managed by machines called 'willows or willeys,' 'blowers' and 'openers.' By the first of these, which consists of a drum covered with small spikes moving in a hollow cylinder, also lined with spikes, but so arranged that those on the drum pass close to, but do not come into collision with them as it revolves, the cotton or wool is fed in on one side, is dragged forward by catching on the spikes, and is delivered at an opposite opening to that by which it entered, in a loose state and free from knots. It is not, however, quite loose enough for the subsequent operations, and it is more or less mingled with impurities. It is therefore taken to the 'blower' or 'opener,' and being put into a shaft, is there acted upon by a stream of air violently

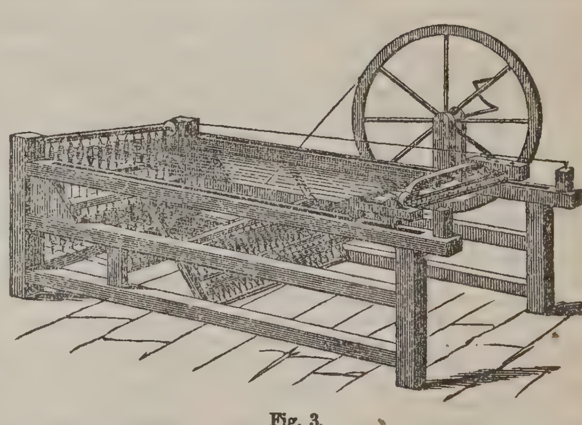


Fig. 3.

driven in by machinery, which blows it forward removes extraneous matters, and so separates the fibres that they pass out at the other end in a

exceedingly light flocculent state, and ready for being formed into *laps*. This operation consists in laying the material very equally on an endless apron made of small bars of wood, and of the width of the frame of the machine in which they are placed. This apron (*a*, fig. 4) passes round two rollers, placed at

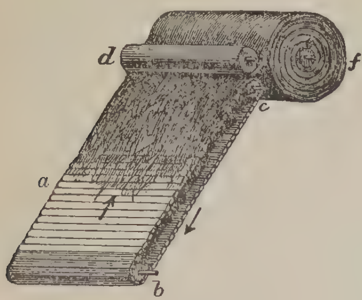


Fig. 4.

a little distance apart, as in fig. 4, *b*, *c*, the rollers being moved by machinery. The arrows indicate the direction in which the apron moves; and as the operator covers its entire surface with a thin layer of the fibre, it passes under the roller *d*, and is taken on to the roller *e*, in the form of a compressed layer of cotton or wool, called a *lap*. When the roller *e* is full, it is removed, with its lap *f*, to make way for another. Much care is taken in weighing out and distributing the material of these laps, because upon this first operation the ultimate size of the yarn depends.

The laps are taken to the *carding-machine*, consisting of a series of cylinders revolving in a frame, and placed so close together that they almost touch each other. Each cylinder is covered with a coating of fine steel wire points, which are stuck in leather, or some other flexible material, and are technically called *cards*. The production of these cards by machinery is in itself a marvel, and the automatic machines for making them are wonderfully effective. Each piece of wire is bent as in fig. 5, and is put through two holes in the leather, as in fig. 6; *a* shews a bent wire going in, and *b*, *b*, wires completely in the holes in leather,

Fig. 5.

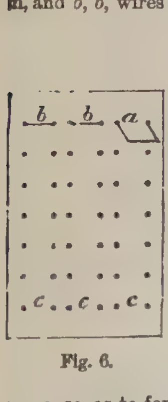


Fig. 6.

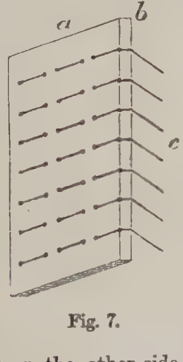


Fig. 7.

c, *c*, *c*, so as to form two points on the other side, and these are slightly bent all in one direction, as in fig. 7, where the piece of card *a* is seen cut through at *b*, to shew the direction given to the wires *c*. There are many variations upon this arrangement of the wires, but the general principle is the same in all. The machine for making the cards cuts the wire to the right lengths, bends them, pierces the holes in the leather, inserts the wires, and finishes by giving them the slight sloping direction which is essential.

The lap is made of the same width as the cylinders of the carding-machine, and is so adjusted that, as it unwinds from its roller, it passes in between a pair of the carding cylinders, the steel wire teeth of which seize hold of the individual fibres, and drag them in one direction until they are caught by other cylinders, and so carried from one to another, always being pulled in a straight direction until they are laid as nearly as possible side by side, and are given off in a thin cobweb-like film at the last cylinder, where it is prevented from continuing its journey round the cylinders by a small bar of metal called the *doffer*, which, with a gentle and peculiar motion, removes it from the cylinder. The film of fibre is of the same width as the cylinder of the carding-machine, but it is gathered together by the operator, who passes it through a smooth metal ring, and between two small polished rollers, the revolutions of which carry it forward, and deposit it in a deep tin can in the form of a loose untwisted column of cotton or wool, about an inch in thickness, which is called a *sliver*. A small portion of this arrangement is shewn in fig. 8, which represents a carding-machine

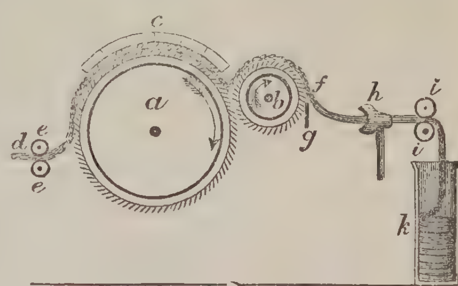


Fig. 8.

with only two carded cylinders, *a* and *b*; they are, however, much more numerous. There is also a concave piece of carding, *c*, which was formerly much used, but has lately given way to additional cylinders, but it makes the action more apparent in a drawing; *d* is the lap drawn on by the action of the two small rollers *e*, *e*, which slightly press it as they revolve. It is quickly distributed all over the surface of the large cylinder *a* by means of its numerous wire-teeth; and as it passes the roller *b*, the teeth of which move in an opposite direction, as indicated by the arrows, the fibres are caught off the large, and are carried round the small cylinder until they reach *f*, where they are stripped off by the doffer *g*, and are passed through the ring *h*, and the rollers *i*, *i*, into the tin receiver *k*. The sliver is now in the first stage of spinning; it has next to be drawn out very gradually until it is not thicker than a quill; and in drawing it out, the operator gives it a very slight twist, still leaving it so loose in structure that it will break with a slight touch; in this state it is called a *roving*; and it was at this stage that the spinning-jenny began to operate upon it. The rovings, which were wound as they were drawn upon large reels, were unwound by the machine, and were still further drawn out and firmly twisted and wound on to spindles or cops, the drawing being regulated by the pressure of the wooden bars of the jenny, which was within reach of the operator's hand.

The *throstle-machine*, patented by Arkwright in

1769, had for its object the drawing of the rovings through a succession of pairs of rollers, each pair in advance of the others, and moving at different rates of speed. The first pair receive the sliver, compress it, and pass it on to the second pair, which revolve at a greater speed, and thus pull it out to exactly the number of times greater length that their revolutions exceed those of the other pair—in number it is usually eight times—and as the first roving is passed through a second, third, and sometimes fourth machine, the finished roving is 32 times longer than the sliver. As the roving issues through the last rollers of each machine, it is received on *spools* or *reels*, calculated to hold a given quantity; and these are transferred to the *spinning-frames*, which resemble the *roving-frames*. Here the roving takes the place of the sliver; and as it unwinds from the spool, is drawn through successive pairs of rollers, moving as before at different rates, each succeeding pair faster than the backward ones, so that the roving gets thinner and thinner, until the tenuity is carried as far as desirable. It is then carried on to a spindle which revolves with great rapidity; and by means of a simple arrangement, is made both to twist the thread and wind it on the spindle ready for the weaver.

This system produces too great a strain upon the thread in its progress to admit of its being drawn so fine as is wanted for many purposes, and this led to the invention of the *mule-jenny* by Crompton (q. v.) in 1779, which has a travelling frame upon which the spindles are set. This frame is now made long enough to carry hundreds of spindles, and it gently draws out and twists the thread after it leaves the last pair of rollers; and when it has reached its limits—now several yards, but in Crompton's time only five feet—it rapidly returns, winding up the spun thread on the spindles as it goes back. These machines are now applied, with various necessary modifications, to cotton, wool, flax, silk, and other textile materials, and the effect they have exerted upon our manufactures is more wonderful than anything in the whole history of commerce. Previous to the invention of the mule, few spinners could make yarn of 200 hanks to the pound (the hank being always 840 yards). At the same time, the natives of India were weaving yarn of numbers ranging between 300 and 400. Now, however, our manufacturers have reached such extraordinary perfection, that Messrs Houldsworth of Manchester have succeeded in making No. 700, which was woven by the French firm Messrs Thivel and Michon of Tavare, and others far too fine to weave, the greatest tenuity reached being 10,000, a pound of which would reach 4770 miles. This was made to test the perfection of the machinery, but was of no practical value.

The most modern improvements in spinning are in the machines of Messrs Platt & Co. of Oldham, which combine all the operations of carding, roving, and spinning in one machine. These and similar machines are now coming into almost universal use for cotton and wool.

SPINOZA, Baruch (= *Benedict*), one of the greatest philosophers of modern times, was born at Amsterdam on the 24th of November 1632. His parents, rich Portuguese Jews, had their son diligently instructed in the Bible and its commentaries, and the Talmud. But after having mastered both, and imbibed the philosophical spirit of such commentators as Aben Ezra, he was allowed —the more readily that his sickly constitution unfitted him for a commercial career—to devote himself entirely to a life of study. Physical sciences and the writings of Descartes, to which he turned first of all, very soon drew him away from the rigid belief and practices of the synagogue; and Saul Levi Morteira, his talmudical teacher, who had built the fondest hopes upon the genius of his pupil, was the first to threaten him with the direst punishment if he did not retract the rank heresies that he began openly to utter. S., after a time, entirely withdrew from the community of his brethren, who formally excommunicated him. A fanatic even attempted to frighten him by an either real or feigned attack upon him as he left the theatre one night. At that period, the young truth-seeker made the acquaintance of the young and beautiful daughter of Van den Ende, his master in Greek and Latin, and fell passionately in love with her, but was rejected. From that time forth, Philosophy became the sole aim and object of his life. In accordance with the teachings of the sages of the Mishna, S. had, apart from his studies, made himself master of a mechanical craft. He had learned the art of polishing lenses. This now became the means of his subsistence. Besides, he was also an expert in the art of design, and among a number of other portraits, he drew one of himself in the dress of Masaniello.

When 28 years old, he left Amsterdam, and went to Rhynsburg, near Leyden, where he wrote the *Abridgment of the Meditations of Descartes*, with an Appendix—the latter being the first cast, so to say, of his *Ethics*. The year following, he removed to Woorburg, near the Hague, and shortly afterwards, yielding to the solicitations of his, by this time, numerous friends, he removed to the Hague itself. The Elector of the Palatinate, Charles Lewis, next offered him a vacant chair at the university of Heidelberg, with full 'liberty of teaching,' provided he would not say aught to prejudice the established religion, i. e., Christianity; whereupon S. declined the both lucrative and honourable professorship. His small pittance was enough to satisfy his wants. In a similar way, he refused generous offers made to him by wealthy friends, like Simon de Vries, who intended to bestow a large sum of money upon him. All he could be prevailed upon to accept was a small annuity of a few hundred florins; the rest he persuaded his generous friend to bestow upon his (De Vries') own brother. An offer of a pension, on the condition of his dedicating a work to Louis XIV., he rejected with scorn. His domestic accounts, found after his death, shew that he preferred to live on a few pence a day, to being indebted to another's bounty. He died, 44 years old, on the 21st of February 1677. Throughout his life of study, of abstemiousness, of bodily and mental suffering—for his constitution was undermined no less by consumption and overwork, than his sensitive mind was wrought upon by the violent severance of all natural ties of affection, to say nothing of the misery of occasional want and of perpetual persecution—no complaint ever passed his lips. Simplicity and heroic forbearance, coupled with an antique stoicism and a childlike, warm, sympathising heart, were the principal attributes of him who was nicknamed epicurean and atheist by his contemporaries. It has well been said, that no man, perhaps, was more filled with religion than S., and that to be an epicure at the rate of twopence-halfpenny a day cannot be a very serious crime.

Respecting S.'s philosophical system, of which we can only give the very faintest of outlines here, it must be premised that it developed itself on the basis of Descartes. The latter had inaugurated a new epoch by his 'reconstruction' of knowledge. Dissatisfied both with the dogma and the scepticism around him, he cleared the ground by first doubting everything, and then laying a new foundation by *Cogito, ergo sum* (I think, I therefore am). S.,

however, deeply struck both with the reasonings and conclusions of Descartes, took his 'I think, therefore I am,' merely as a starting-point to prove more clearly the existence of God than Descartes did. The consciousness of man's own existence and of his imperfect state, are not, he thinks, sufficient to solve the grand problem. He therefore assumes, first of all, three fundamental things, which he calls respectively Substance, Attributes, and Mode. By substance he understands, like Descartes, that which needs nothing else to its existence; but, unlike Descartes, he assumed only One such Substance—God. Yet this term is not to be understood in the ordinary sense, for S.'s God neither thinks nor creates. There is no real difference, he holds, between mind, as represented by God, and matter, as represented by Nature. They are One, and according to the light under which they are viewed, may be called either God or Nature. The visible world is not distinct from him. It is only his visible manifestation, flowing out of him, who is the last fountain of life and essence, as a finite from the infinite, variety from unity—a unity, however, in which all varieties merge again. Extension and thought, which, with Descartes, had been two Substances, with S. become 'Attributes;' that which the mind *perceives* as *constituting* Substance. Extension is visible Thought; Thought is invisible Extension. The relation between Substance and Attributes, S. illustrates by the example of an object—colourless in itself, perhaps—seen through yellow or blue spectacles. And this explains the relation between body and mind, and the complete unity between them. The mind is the idea of the body—i. e., the same thing considered under the attribute of thought. The *modus* or *accidens* is only the varying form of Substance. Like the curling waves of the ocean, they have no independent existence; nay, less than these are they things of reality; but they are simply the ever-varying shapes of the Substance. Substance, thus, is the only really existing, all-embracing essence, to which belongs every thing perceptible to our senses, and not perceptible. Thus, every thought, wish, or feeling is a Mode of God's Attribute of thought; every thing visible is a Mode of God's Attribute of extension. God is the 'immanent idea,' the One and All. 'World' does not exist as world—i. e., as an aggregate of single things—but is one complex whole and one peculiar aspect of God's infinite Attribute of extension. The variety we behold in things is a mere product of our faulty conceptions, particularly of, as S. terms it, our 'imagination,' which perceives unity as a complex of multiplicity.

On these metaphysical speculations he founds his Ethics, which he deduces in a mathematical form, after the method of Euclid. The chief doctrines are: The absence of free-will in man—himself only a *Modus* dependent on causes without, and not within him. Will and Liberty belong only to God, who is not limited by any other Substance. Good and Evil are relative notions, and sin is a mere negative; for nothing can be done against God's will, and there is no idea of Evil in Him. Utility alone, in its highest sense, must determine the good and the evil in our mind. Good, or useful, is that which leads us to greater reality, which preserves and exalts our existence. Our real existence is knowledge. Highest knowledge is the knowledge of God. From this arises the highest delight of the spirit. Happiness is not the reward of virtue, but virtue itself; and this is to be attained by a diligent following in God's ways. Sin, evil, negation, &c., are merely things that retard and obstruct this supreme happiness.

S.'s system, Pantheism or Atheism, as it has been variously called, appears to be nothing but the most rigid, most abstract Monotheism that can be conceived by man. There is only Substance, only God—nought else. It was not unnatural, however, that this system should be misunderstood either as materialism or as pantheism, seeing the word 'substance,' which, with S., means 'existence,' is, in ordinary language, associated with the idea of matter or body. Be this as it may, 'this most iniquitous and blasphemous human invention,' as it has been called for 200 years, has become the acknowledged basis of modern German philosophy; and pious theologians like Schleiermacher did not hesitate to apply the highest terms of 'pious, virtuous, God-intoxicated,' to S., who, we need not add it, never left Judaism, although he left the synagogue and its human formalities.

His principal works are—*Renati Descartes Principiorum Philosophiæ, Pars I. et II., more geometrico demonstratæ* (Amsterdam, 1663); *Tractatus Theologico-politicus* (anonymous, with the feigned place of imprint, 'Hamburg' instead of Amsterdam, 1670; Eng. translation, anonymous, Lond. 1862); the *Opera Posthuma*, edited in the year of S.'s death by Ludwig Meyer and Jarrig Jellas, contain: 'Ethica more Geometrico,' 'Tractatus Politicus,' 'Tractatus de Intellectus Emendatione,' 'Epistolæ,' 'Compendium Grammatices Linguæ Libræææ.' Several other minor treatises are lost. According to Colerus, S. also intended to translate the Bible, and had completed already the Pentateuch, but nothing of it has survived. There is a German translation of S.'s collected works by B. Auerbach (Stuttg. 1841), 5 vols. An English translation, with a Life of S., has been promised by G. H. Lewes.

SPIRÆ'A, a genus of plants of the natural order *Rosaceæ*, and of the suborder *Spiræeæ* in

Queen of the Meadow (*Spiræa Ulmaria*).

which the fruit consists of five or fewer capsular carpels distinct from the calyx, and each containing 1—6 seeds. The genus S. has one or more follicular, many-seeded carpels. It contains a large number

of species, natives of Europe, Asia, and America, herbaceous plants and low deciduous shrubs; of the herbaceous species, two are natives of Britain, DROPWORT (*S. Filipendula*), and MEADOW SWEET or QUEEN OF THE MEADOW (*S. Ulmaria*), both with interruptedly pinnate leaves and flowers in cymes. Dropwort is a native of dry upland pastures; it is tonic and fragrant; and its tubers, which are somewhat nutritious, are in Sweden ground and made into bread. Meadow Sweet is well known for the powerful fragrance of its flowers. A fragrant distilled water is prepared from them. A North American species (*S. tomentosa*), called HARDHACK in the United States, is there used as a tonic and astringent. Many of the shrubby species are frequently planted for ornament.

SPI'RAL, in Geometry, is the name given to a class of curves which, during their gradual regression from a point, wind round it repeatedly. Their equations are generally expressed in terms of polar co-ordinates, and are all necessarily of the form $r = f(\theta)$, where θ never signifies a function of the angle, but the angle itself or a multiple of it. Several such curves have received distinguishing epithets, either on account of the properties they possess, or from their inventors; the chief of them are—the *equable spiral* or the *spiral of Archimedes*, whose equation is $r = a\theta$, and which, commencing at the origin, circles round and regredes from it with unvarying uniformity; the *hyperbolic* or *reciprocal spiral* ($r\theta = a$); the *logarithmic* or *equiangular spiral* ($r = ab^{\theta}$); which recedes from the centre or origin with a velocity increasing as the distance, and always cuts the radius vector at the same angle; &c.

SPIRAL VESSELS are those very delicate air-tubes in the cellular tissue of plants which run unbranched through the different parts of the plant, and whose walls are composed of fibres spirally or circularly twined. Spiral vessels are either *free*, when their windings are unconnected with each other, or *net-like*, when the windings are involved with each other in a net-like manner. If the free spaces between the convolutions in the latter are linear, they form *lined* vessels; but if they are point-like, they form *punctate* or *porose* vessels. Spiral vessels, whose walls are formed of distinct horizontal rings, placed simply one above another, are called *annular* vessels. Spiral vessels seldom occur singly, but are generally united by cells into bundles called vascular bundles. These vascular bundles are scattered in the stems of endogenous plants; but in the stems of exogenous plants they are arranged in one or more concentric circles. Amongst cryptogamous plants, the ferns alone (in the most extensive signification of the term) are provided with spiral vessels. All plants which have spiral vessels are called *Vascular Plants*, in contradistinction to *Cellular Plants*, whose substance consists of cells only.

Through the operation of what laws the spiral form is assumed by spiral vessels, is still unknown, although the question has naturally been regarded as having an intimate connection with the tendency to spiral structure manifested in plants, and even in some of those cryptogamous plants in which no true spiral vessels are found; a tendency which is observed not only in spiral stems, spiral tendrils, the spiral fibres of the elaters of *Jungermanniæ*, and the like, but throughout the vegetable kingdom generally in the spiral arrangement of leaves and of the organs which are formed by the metamorphosis of leaves. The whole subject is an extremely difficult one; there has been much speculation about it, but as yet with no satisfactory results.

SPIRE, a very acute pyramidal roof in common use over the towers of churches. The history of spires is somewhat obscure, but there is no doubt that the earliest examples of anything of the kind are the pyramidal roofs of the turrets of Norman date. Those of St Peter's, Oxford (fig. 1), and Rochester Cathedral (fig. 2), are good specimens of circular and octagonal spires on a small scale. Spires of this early period are much lower than those of later date. The early English style has spires of acute form over the larger towers. They are generally what are termed broach spires, i. e., the slopes spring from the cornice of the tower without any parapet, and at the point where the square changes to the octagon, there is a small set-off or separate roof. (Fig. 3, St Mary's, Cheltenham, indicates this arrangement.) Sometimes the angles at top of towers were occupied with pinnacles or sloping

1, Turret, St Peter's Church, Oxford; 2, Turret, Rochester Cathedral; 3, St Mary's Church, Cheltenham; 4, Bayeux Church, Normandy.

(From Parker's *Glossary of Architecture.*)

masses of masonry, as at Bayeux Cathedral, Normandy (fig. 4).

In the Decorated style, the spires were more enriched, with a parapet and pinnacles at the top of the tower, crochets on the angles, and enriched windows.

The spires of the Perpendicular and Flamboyant styles are still more enriched, with flying buttresses at the angles, &c. They are sometimes perforated, and the sides of the spire filled entirely with tracery. Such spires are common in Germany, those of Strasbourg and Freiburg on the Rhine being very fine examples. As in the later styles generally, the character and beauty of the spire give place to dexterity in masonry, and many examples exist of traceried spires more wonderful than beautiful. See GOTHIC ARCHITECTURE.

Spires are most frequently constructed of stone, but they are also occasionally made of wood, and covered with lead, copper, slates, or shingles. These are chiefly to be found in localities where stone is scarce.

SPI'RIFER, a genus of fossil brachiopodous mollusca, containing upwards of 200 described species, which have been found in all the strata from the Trias to the Silurian inclusive. They belong to a small group characterised by the possession of two calcareous spiral processes which support the oral arms. The shell and spines are occasionally found silicified in the limestone rocks, and they may then be beautifully developed by means

of acid. They are used with other similar fossils by the Chinese in medicine.

SPIRIT, a name of very general application to fluids, mostly of a lighter specific character than water, and obtained by distillation. Thus, the essential oil of turpentine is called Spirit of Turpentine. Essential oils dissolved in alcohol are called spirits, as Spirit of Aniseed, Peppermint, &c., because formerly prepared by distilling the herbs with alcohol. The volatile alkali ammonia, distilled and condensed in cold alcohol, is called Spirit of Ammonia; even hydrochloric acid is often called Spirit of Salts. But in a stricter sense, the term spirit is understood to mean Alcohol (q. v.) in its potable condition, of which there are very numerous varieties, deriving their special characters from the substances used in their production. Besides the more common kinds, such as Brandy, Rum, Whisky, Gin, Arrack, &c. (see those heads), there are others less well known. In Italy, potable spirits are distilled from the fruit of the Arbutus (*A. Unedo*), from the bulbs of the Asphodel (*A. racemosus*), and the Sea-daffodil (*Pancratium maritimum*). In tropical countries, of late, spirits have been distilled from a great variety of fruits, as the Caju or Cashew, the Indian Fig (*Opuntia*), the Mammee, Oranges, &c.; and in the West Indian Islands, large quantities of a spirit used in medicine, perfumery, and for toilet purposes, are made from the berries of *Myrtus acris* and *M. pimentoides*, under the name of Bay-rum. In the north of Europe, potato spirit is largely made and consumed; and much spirit is now made on the continent from beet-root. In the United States the sale of whisky during the year ending June 30, 1871, was estimated at 60,000,000 galls.; of imported spirits, 2,500,000 galls.; imported wine, 10,700,000 galls.; ale, beer, and porter, 65,000,000 bbls.; native brandies, wines, &c., estimated to be worth $31,500,000; a total valuation of $600,000,000. Prof. Leone Levi estimated in 1870 that 846,000 persons, or, including dependents, 1,500,000, are employed in the liquor trade in Great Britain. The production of beer requires a fixed capital of $220,000,000, and the floating capital employed in making beer, spirits, and importing foreign wines and spirits is $392,000,000.

SPIRIT DUCK. See GARROT.

SPI'RITO SA'NTO. See ESPIRITU SANTO.

SPI'RITUALISM, a system of professed communication with the unseen world, which originated in America about the year 1848, rapidly developed itself in that country, and extended to other parts of the world, obtaining many adherents in Europe, particularly in England and France. In 1859, the Spiritualists reckoned 1,500,000 avowed adherents of their system in America, 1000 public advocates of it, and 30 periodicals devoted to its cause, besides hundreds of books and pamphlets that had already issued from the press. Since that time, the fervour of public excitement on the subject has somewhat diminished, but not the confidence of many believers in Spiritualism, nor their zeal in its advocacy; whilst many additions have been made to its literature, in Britain as well as in America. Amongst its adherents are many persons, particularly in the United States, of high social position and good education, and even some of superior literary and scientific attainments.

Attempts have been made to trace the origin of Spiritualism to the writings of Swedenborg, and there is reason to think that the activity of some of his followers in America contributed to prepare the public mind in some measure for pretensions somewhat similar to his own; an effect which some strange manifestations among the Shakers in the state of New York, in 1843, attracting much attention, probably also concurred in producing. The Spiritualists find their own appearance at the present day predicted in the writings of Swedenborg, but the Swedenborgians hold themselves aloof from them, because they do not follow Swedenborg with implicit reverence; their belief in intercourse with spiritual beings is essentially the same, only differently developed, and in a very different relation to Christianity.

Spiritualism has also in its origin an intimate connection with Animal Magnetism and Clairvoyance. In the article ANIMAL MAGNETISM, it has already been attempted to shew how many of the phenomena of Spiritualism may be rationally explained, without the supposition of imposture, and to this we shall not further refer. Of course, the possibility of such an explanation of phenomena which have astonished many previously most incredulous, and made them at once extreme in their credulity, is not incompatible with the belief, that there has been much imposture practised by those who have made Spiritualism a trade and means of gain.

Spiritualism, strictly so called, may be said to have had a precursor in Andrew Jackson Davis, known in America as 'the Seer of Poughkeepsie.' Davis was born in 1826, of humble parentage, his father being a cobbler, in Orange County, state of New York; spent his youth in tending cattle, was at school only for five months, and was there regarded as a dunce. He seems, however, to have been a dreamy youth; he saw visions, and he heard voices, which sometimes distinctly said: 'To Poughkeepsie;' and thither he induced his parents to go, the village cobbler becoming a journeyman shoemaker, and his son an apprentice to the same trade. Wonderful communications from the unseen world continued to come to him, which he believed to be from the disembodied spirits of human beings. When he sung songs, he often imagined that spirits replied to him, sometimes contradicting what the song expressed; particularly when he sung a temperance song which speaks of our friends once dear as 'in their graves laid low,' to which a voice always answered 'No.' In the end of 1843, after the visit of an itinerant mesmerist to Poughkeepsie, a tailor, named Levingston, discovered Davis to possess astonishing powers of clairvoyance, and particularly of revealing the 'interior condition' of his visitors, so that he could tell their diseases and prescribe for them. These powers Mr Levingston suggested that he should employ for the good of his fellow-creatures; and he began, with Levingston as his companion and guardian, a round of visits to the towns of the United States, looking through the bodies of invalids, revealing their complaints, and prescribing for them, for the fee of five dollars. His success was very great, in the city of New York and elsewhere. At Bridgeport, in Connecticut, he found two gentlemen, Dr Silas Smith Lyon and Mr William Fishbough, who appreciated his powers very highly, persuaded him to throw up his connection with Levingston, and under their guidance, to enter on a still more adventurous and lucrative career, in making revelations concerning the unseen world. Levingston afterwards disputed these revelations, and ascribed them to Lyon and Fishbough as their authors; but they were readily received by many in all parts of America, notwithstanding their very extraordinary character. Davis, it was now alleged, entered for the first time permanently on what he calls *clairscience*, or *the superior condition*, far above that of ordinary clairvoyance; and proceeded to dictate a book, of the *Principles of Nature*, or 'divine revelations of Nature,' which in due

time was followed by *The Great Harmonia; being a Philosophical Revelation of the Natural, Spiritual, and Celestial Universe.* It is impossible to exhibit in our space more than a specimen or two of the strange things which these books contain. Nor can we afford to quote from the grotesque verse of the *Divine Harmonia.* A new view of the spiritual world was presented to mankind. Sin was declared not to exist; and the interior principle of man to be of divine origin, and incapable of contamination, all evil being merely external. With these views were associated such as the following sentences express: 'It is a law of matter to produce its ultimate, mind.' 'All ultimates are matter.' 'Man, spiritually, is the perfection of motion.' 'The universe is animated by a living spirit, to form the whole, *one grand man.*' 'Man is a part of this great body of the Divine Mind. He is a gland, a minute organ.'

Davis represented himself as obtaining knowledge of any kind and on any subject, according to his wish, in his *superior condition.* 'I pass from the body,' he says, 'with a desire for a particular kind of information. This desire attracts the particular kind of truth of which I would be informed, separates it from all other things, and causes it to flow into the mind.' Thus he was easily able to exhibit a complete scheme and history of the universe, going back to the beginning, when 'the *Univercœlum* was one boundless, indefinable, and unimaginable ocean of liquid fire.' The universe is declared to consist of seven concentric spheres, surrounding the centre of the earth, and at distances increasing outwards, each of which 'is but one beautiful step in the ladder that reaches to heaven, and the seventh is the most beautiful of all.' Davis does not hesitate to describe the inhabitants of the various planets, and very extraordinary beings they are—those of Saturn, for example, being morally and intellectually perfect; those of Jupiter, in size, beauty, and symmetry of form, excelling the earth's inhabitants, but walking like quadrupeds; those of Mars having hair, not on their heads, but on the back of their necks; &c. It was left for others after him, however, to improve the scheme of Spiritualism, by peopling the different spheres with the disembodied spirits of men who once inhabited the earth, particularly to declare the conditions of their existence in one sphere and another, and readily to summon them from any of the spheres to hold communication with their friends or with curious inquirers in this world.

Whilst the public mind in America was much occupied with the revelations of Davis, new wonders claimed attention. In April 1848, strange rappings began to be heard in a house in the town of Acadia, state of New York, inhabited by Mr Fox. A young girl, a daughter of Mr Fox, imitated the rappings by snapping her fingers, and to the surprise of the family, there was an evident response. The question was then asked: 'Are you a human being?' and there was no reply; but to the question: 'Are you a spirit?' a reply was made by two distinct knocks. Means were thus found of opening up communications; and by rapping in reply to questions, and in assent to letters of the alphabet, so as to spell out words, the mysterious visitor declared himself to be the spirit of a man who had been murdered in that house some years before. Further progress in the art of communication with the unseen world was soon made; it was found that disembodied spirits were quite ready to come when required, and answer by rapping such questions as might be proposed to them, although only certain persons, supposed to be constituted somewhat differently from others, were capable of becoming *mediums* of communication with them. Misses Catherine and Margaretta Fox were excellent mediums, and they were gradually induced, by the pressure of public curiosity, and a desire of vindicating themselves from the charge of imposture, to exhibit their gifts in various towns of the United States. Many others soon followed their example, and the belief in Spiritualism spread very rapidly and widely, amidst much newspaper discussion and other controversy.

Nor did the spirits long continue to make known their presence or make communications to mortals by rapping alone. Mediums became celebrated for tipping or turning of tables under a slight contact of the finger, for moving heavy bodies without contact, for producing phosphorescent lights in a dark room, for playing on musical instruments, for writing, drawing, &c. Particular use was made of a simple method of obtaining communications from spirits by means of 'the card-process,' the letters of the alphabet being printed on a card, and the medium, under spirit-guidance, spelling out the requisite words. Writing mediums, regarded as the mere instruments of the spirits, made the intercourse still more easy and rapid. All this, and much more, was received and implicitly credited by multitudes; while vast numbers, after witnessing the alleged phenomena, continued to believe that there was nothing in them but imposture on the one hand and delusion on the other.

Spiritualism could not long be confined to the land of its birth. From time to time, after 1852, American mediums of note, of both sexes, took up their abode in London, where they exhibited the various phenomena, generally receiving a small fee from their visitors. As in America, private circles were gradually formed, in order to test the truth of the alleged facts, free from the suspicion naturally arising in connection with paid mediums. And it was matter of general surprise how wide-spread, for a short time, became the furor for table-turning, table-tipping, and other modes of inducing the supposed action of disembodied spirits. These practices were not confined to a low and under-educated grade of society; they were in vogue chiefly among the upper classes, although little countenanced by men of science. Mr Faraday announced, that when a sheet of paper was placed on the table, the table did not turn under the finger, whence he inferred that, unconsciously, rotatory impulse was given by the votaries; but the believers were little affected by this objection, asserting that the necessary conditions were in that case simply marred; while the test altogether failed to apply where tables moved without contact, and in many others of the phenomena. Before 1858, there were several native mediums in London, mostly amateur, and only practising in privacy, and there was no lack of controversy on the subject; but faith in the phenomena did not spread with more than a small share of the facility which had been experienced in America. A considerable impulse was given to it by the arrival of a medium from that country (1855) whose qualifications seemed to be super-eminent. This was Mr Daniel D. Home, a young man of humble birth and narrow education, who states that from his cradle mystic circumstances had taken place in connection with his person, and who had actually been turned out of doors by an aunt, his early protectress, in consequence of the diabolic disturbance, as she considered it, which he was the means of creating. In the presence of Mr Home, an accordion held by the end opposite to the keys played the finest music; tables and chairs moved without contact; the hands of disembodied

spirits appeared at the side of a table, or touched the knees of those sitting at it; mystic lights were seen. Most surprising of all, it was stated by various professed eye-witnesses that Mr Home was occasionally lifted off his feet and passed floating through the air, while the accordion would also float about under the ceiling of the room, discoursing the divinest voluntaries. Mr Home is understood to have been received in the privacy of many of the sovereigns of Europe, particularly the Emperor Napoleon, who, when asked if he believed these strange things to be true, answered: 'I *know* them to be so.'

The chief obstacle, in most minds, to a belief in Spiritualism is the obvious consideration, that, while the conjuror can cheat the ordinary observer so wonderfully, the medium may do so too. And this view is supported by one or two circumstances calculated to excite suspicion, viz., that generally the spirits will only work in the dark, and that the presence of a determined sceptic is unfavourable to their manifestations. Nevertheless, Spiritualism has impressed itself as a truth in quarters where its reception was least to be expected; and many excellent persons declare that they have found a comfort in its teachings which they have been able to obtain from no other source.

The reader who wishes to learn more of Spiritualism, has a wide range of books of information open to him. For an account of the early proceedings of the Fox family and others in America he is recommended to consult Capron's *Modern Spiritualism, its Facts and Fanaticisms* (Boston, U. S., 1855). For a view of the higher phenomena since brought into notice, *Incidents in my Life*, by D. D. Home (Lond. 1863), may be recommended. In *Spirit Drawings, a Personal Narrative*, by W. M. Wilkinson (Lond. 1858), will be found a curious history, relating how the author's wife, ignorant of art, was impelled to produce a series of elaborate drawings of the greatest beauty, and all having a mystic significance. There is, however, no English publication which gives a more interesting view of these alleged wonders than a volume entitled *From Matter to Spirit* (Lond. 1863), which is understood to detail ten years' experiences in spirit manifestations of the wife of a distinguished mathematician, a professor in London University College, who prefixes a preface full of curious reasonings on the subject.

A brochure privately printed (1865) under the title of *Remarks on Certain Phenomena*, endeavours to meet the great objection of the scientific world to Spiritualism, viz., that it exhibits a system of supernaturalism, by asserting on the contrary that, though but imperfectly understood, it appears, from its connection with physical and physiological conditions, to be as purely a part of nature as the phenomena of the living organism. According to this writer, the Emperor Julian was a medium affected by communications from pagan spirits, and the religion founded by Mohammed had spiritual communications for its basis. The late Professor Baden Powell, in his Essay on the Spirit of the Inductive Philosophy, seems to intimate an inclination to believe that spiritual phenomena will yet be recognised as a part of the domain of nature, and become a subject for philosophic investigation. In the present state of science, he remarks, 'of all subjects that on which we know least is perhaps the connection of our bodily and mental nature, the action of the one on the other, and all the vast range of sensations, sympathies, and influences, in which those affections are displayed, and of which we have sometimes such extraordinary manifestations in peculiar states of excited cerebral or nervous action, somnambulism, spectral impressions, the phenomena of suspended animation, double consciousness, and the like. In such cases, science has not yet advanced to any generalisations; results only are presented which have not as yet been traced to laws; yet no inductive inquirer for a moment doubts that these classes of phenomena are all really connected by some great principle of order. If, then, *some peculiar manifestations* should appear of a more extraordinary character, still less apparently reducible to any known principles, it could not be doubted by any philosophic mind that they were in reality harmonious and conspiring parts of some higher series of causes as yet undiscovered. The most formidable outstanding apparent anomalies will at some future time undoubtedly be found to merge in great and harmonious laws, the connection will be fully made out, and the claims of order, continuity, and analogy, eventually vindicated.'

SPIRO'PTERA (Gr. *speira*, a coil, and *pteron*, a feather or wing) is the name which has been given to a supposed genus of parasitic worms. Only one species, *S. hominis*, has been described. There is only one case on record of these worms being found; and it was, however, distinctly shewn in 1862 by Schneider, who had carefully examined the specimens in the Berlin Museum, which had been sent thither half a century previously, that the so-called *Spiroptera hominis* is neither more nor less than the exceedingly common nematode worm which abounds in the cod and haddock, and is known as the *Filaria piscium*.

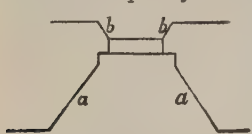
SPI'RULA, a genus of dibranchiate Cephalopoda (q. v.), constituting the family *Spirulidæ*. The animal resembles a cuttle-fish, having, like it, eight arms, two tentacles, and an ink-bag; but it is destitute of fins, and has a chambered shell, like that of the nautilus. Three species have been distinguished, all inhabiting the seas of the warmer parts of the world, particularly of the southern hemisphere. Shells of Spirulæ are strewed in abundance on the shores of New Zealand. A few are brought by the Gulf Stream to the south coast of Ireland and the south-west coast of England. The Spirulæ are extremely interesting, from their relation to ammonites and other fossil cephalopods.

SPI'TALFIELDS, a district of London, adjoining Bethnal Green, derives its name from the *hospital* of St Mary, founded there, in 1197, by Walter Brune and his wife Rosia, and is inhabited chiefly by silk-weavers and other poor people. The manufacture of silk was established in S. by emigrants from France, after the revocation of the Edict of Nantes.

SPI'THEAD, a celebrated roadstead on the south coast of England, and a favourite rendezvous of the British navy, is the eastern division—the Solent (q. v.) being the western division—of that strait which separates the Isle of Wight from the mainland. It is protected from all winds, except those from the south-east, and its noted security warranted the name, which has been applied to it by sailors, of the 'king's bedchamber.' It receives its name from the 'Spit,' a sandbank stretching south from the English shore for three miles; and it is 14 miles long by about 4 miles in average breadth. Here, in 1797, the sailors of the Channel Fleet mutinied for more liberal pay and allowances, which were granted to them. See SPITHEAD FORTS in SUPP. in Vol. X.

SPITZBE'RGEN, a group of islands in the Arctic Ocean, in lat. 76° 30′—80° 40′ N., and long. 9°—22° E., lies 300 miles north of Scandinavia, and 325 east of Greenland. The group, which is estimated to contain about 30,000 Eng. sq. m., is composed of three large and several small islands. The largest of the group, *Spitzbergen Proper*, consists of two oblong and parallel tracts known as West S.

and East S. or New Friesland, connected by a neck of land; the whole strongly resembling a boat-hook in shape. The two next in size are *Egede* and *North-east Island*. Being far within the Arctic Circle, and surrounded by a wide expanse of sea, almost the whole of its surface is covered with perpetual snow and glaciers. The whole of the west side is mountainous, the general elevation being 3000—4500 feet above sea-level; and the same is true of the north-east coast. During ten months of the year, mercury freezes, and for the other two months, the temperature is seldom more than 5° above the freezing-point; yet, during this short summer, about 40 species of plants, which constitute the scanty vegetation of this inhospitable region, succeed in springing up, and producing and ripening their seed. The whole of S. could not afford sustenance for one human being; but it is, nevertheless, a haunt of reindeer, foxes, and bears, and whales and seals abound on the coasts. S. has from time to time been occupied by Dutch and Russian colonies, who were supplied from the mainland of Europe. It was discovered, in 1596, by William Barentz, the Dutch explorer, in his third voyage to discover the North-east Passage, and has since been frequently visited by other explorers and by whalers. It is claimed as a dependency of its European territories by Russia.



Splay.

SPLAY, the sloping or bevelled opening in window recesses and such openings, as at *a*, *a*. Also the corner taken off the outer angle of such openings, as at *b*, *b*.

SPLEEN, The, is the largest and most important of the so-called ductless glands, whose chief object is supposed to be to restore to the circulation any substances that may have been withdrawn from it. It is of an oblong flattened form, soft, of very brittle consistence, highly vascular, of a dark bluish-red colour, and situated on the left hypochondriac region, with its interior slightly concave surface embracing the cardiac end of the stomach and the tail of the pancreas. (See the figure in the article PANCREAS.) It is invested by an external or serous coat, derived from the peritoneum, and an internal fibrous elastic coat. Mr Gray, who wrote the Astley-Cooper Prize Essay, *On the Structure and Use of the Spleen*, states that the size and weight of this organ are liable to very extreme variations at different periods of life, in different individuals, and in the same individual under different conditions. In the *adult*, in whom it attains its greatest size, it is usually about five inches in length, three or four in breadth, and an inch or an inch and a half in thickness, and weighs about seven ounces. At *birth*, its weight in proportion to that of the entire body is as 1 to 350, which is nearly the same ratio as in the adult; while in *old age* the organ decreases in weight, the ratio being as 1 to 700. The size of the spleen is increased during and after digestion, and is large in highly fed, and small in starved animals. In intermittent fevers and leucocythemia, it is much enlarged, weighing occasionally from 18 to 20 lbs., and constituting what is popularly known as the *ague-cake*.

On cutting into the spleen, a section of it shews the presence of numerous small fibrous bands termed *trabeculæ*, united at numerous points with one another, and running in all directions. The parenchyma, or proper substance of the spleen, occupies the interspaces of the above described areolar framework, and is a soft pulpy mass of a dark reddish-brown colour, consisting of colourless and coloured elements. The *colourless elements* are described by Gray as consisting of granular matter, of nuclei about the size of the red blood-discs, and a few nucleated vesicles; and as constituting one-half or two-thirds of the whole substance of the pulp in well-nourished animals, while they diminish in number, and sometimes altogether disappear in starved animals. The *coloured elements* consist of red blood-discs and of coloured corpuscles either free or included in cells; sometimes enlarged blood-discs are seen included in a cell, but more frequently the enclosed discs are altered in form and colour, as if undergoing retrograde metamorphoses. Besides these, numerous deep-red, or reddish-yellow, or black corpuscles and crystals, closely allied to the hæmatin of the blood, are seen diffused through the pulp-substance.

The venous blood of the spleen is carried away by the splenic vein, which contributes to form the great portal venous system, distributed through the liver; while arterial blood is supplied by the splenic artery, the largest branch of the cœliac axis. The branches of this artery subdivide and ramify like the branches of a tree, with the *Malpighian* or *splenic corpuscles* attached to them like fruit. These splenic corpuscles, originally discovered by Malpighi, are whitish spherical bodies, which are either connected with the smaller arterial branches by short pedicles, or are sessile upon their sheaths. They vary considerably in size and number, their diameter usually ranging from one-third to one-sixth of a line. Each consists of a membranous capsule, homogeneous in structure, and formed by a prolongation from the sheath of the artery. The blood-vessels ramifying on the surface of a corpuscle consist of the larger branches of the artery with which it is connected, of venous branches, and of a delicate capillary plexus. From this arrangement of the vessels, it may be inferred that active changes are carried on in the contents of these corpuscles, which consist of a soft, white, semi-fluid substance, made up of granular matter, nuclei similar to those found in the pulp, and a few nucleated cells. These splenic corpuscles are much more distinct in early life than subsequently, and are much smaller in man than in most mammals. They, however, bear a remarkable relation to the general state of nutrition, being much the greatest in well-fed animals, especially in the early periods of the digestion of albuminous food; while they diminish extremely in ill-fed animals, and in those that have been starved, they disappear altogether.

The chemical composition of the spleen confirms the view that a retrograde change of tissue occurs very freely in it. In 1000 parts, there were found (by Oidtmann) nearly 250 of solid residue, of which more than 243 was organic, consisting of albumen, fats, inosite, uric acid, sarcine, xanthine, leucine, tyrosine, and pigment, all of which, excepting the first two, are products of the metamorphosis of tissue. This gland also contains a large quantity of oxide of iron, obtained probably from the disintegration of red blood-discs in it.

With regard to its uses, it may be regarded as a storehouse of nutritive material, which may be drawn upon according to the requirements of the system; and of the exertion of an assimilative action upon the albuminous matter, during its withdrawal from the general current of the circulation, we have direct evidence in the large increase in the proportion of fibrin contained in its venous blood—the blood of the splenic vein sometimes containing nearly six times the usual quantity of fibrin. Before the institution of the chemical inquiries which led to the above conclusion, it was held that the function of the organ was to act as a reservoir for the portal

blood, with the view of preventing the portal vessels from being unduly distended during the digestive process. To what extent it is the seat of the disintegration of old blood-corpuscles, and of the formation of new ones, is still uncertain. The removal of this organ from the body has frequently been performed in animals without serious effects; but in some of these cases, small secondary spleens are developed, and in others, various sets of lymphatic glands are observed to increase rapidly, shortly after the operation, and these probably act vicariously for the spleen. Its singular and complicated microscopic structure, and its extreme vascularity, would lead to the inference that this is a highly important viscus.

It is unnecessary to enter into any detail regarding the diseases of the spleen, as most of them occur secondarily in the course of other affections, as in Intermittent Fever (Ague) and Leucocythemia (q. v.), when it is sometimes enlarged to 40 times its natural weight. It is sometimes diminished to the size of a walnut, the cause of this atrophy being unknown, but the apparent result being a loss of colour, and a comparatively bloodless condition. The spleen is also liable to the singular morbid change known as *Waxy Degeneration* in which the presence of starch-like amyloid granules is observed in the tissue on submitting it to a microscopico-chemical investigation. These remarkable granules dissolve when heated in water, and by the action of iodine acquire a bluish tint, but not the pure iodide of starch purple. In their ultimate composition, however, these granules resemble the albuminates rather than starch, inasmuch as they contain nitrogen.

SPLEE′NWORT. See ASPLENIUM.

SPLE′NIC APOPLEXY, a disease of cattle and sheep, resembles Black Quarter (q. v.) in suddenly attacking animals in good thriving condition, and, like it, appears to depend upon the rapid manufacture of insufficiently elaborated blood, probably faulty in the healthy proportion of some of its constituents. The animal staggers, froths at mouth, throws itself about in convulsions, and sometimes dies within an hour. Few cases recover. The blood is thin, dark-coloured, and indisposed to coagulate. It accumulates in the large internal organs, particularly in the liver and spleen, and is poured out on the mucous surfaces. If the animal is seen in time, and before the pulse becomes small and weak, a moderate bleeding may be tried. A full dose of physic, with a prompt stimulant, must at once be given, and cloths wrung out of hot water applied, for several hours continuously, to the belly and loins. If the animal is weak, and the pulse scarcely perceptible, stimulants must be freely given from the first; and where there is stupor, cold water likewise applied to the head. To prevent the disease, attention must be paid to regular moderate feeding; abundance of wholesome water must be supplied; the grazings not allowed to become too rank, and changed occasionally; rock-salt placed within reach; and a seton inserted in the dewlap of all cattle and sheep pastured upon lands subject to splenic apoplexy.

SPLENISA′TION is a term employed in Morbid Anatomy to indicate a diseased condition of the lung, in which the tissue of that organ resembles that of the spleen in various physical points, such as softness, friability, &c.

SPLINT, or SPLENT, is a bony enlargement on the horse's leg, between the knee and fetlock, usually appearing on the inside of one or both fore-legs, frequently situated between the large and small canon bones, depending upon concussion, and most common in young horses that have been rattled rapidly along hard roads before their bones are consolidated. When of recent and rapid growth, the splint is hot and tender, and causes lameness, especially noticeable when the horse is trotted along a hard road. A piece of spongiopiline saturated with cold water should be applied to the splint, kept in position with a light linen bandage, and wetted with cold water or a refrigerant mixture every hour. Perfect rest must be enjoined for ten days or a fortnight. When the limb is cool, and free from tenderness, the swelling, which will still remain, may be greatly reduced by some stimulating applications, such as the ointment of the red iodide of mercury, the common fly-blister, or the firing-iron.

SPLINT-BONES. The horse and certain allied mammals have what is popularly known as an outer and an inner splint-bone in the skeleton of the leg. Beyond the bones of the carpus and tarsus, there is one very large bone (the metacarpal or metatarsal of the third toe), which supports the whole weight of the animal. On either side of this bone are the outer and inner splint-bones, which are small bones, not running more than half the length of the great central bone, into which they merge. They represent, in a rudimentary form, the metacarpal and metatarsal bones of the fourth and second toe.

SPLINTS, in Surgery, are certain mechanical contrivances for keeping a fractured limb in its proper position, and for preventing any motion of the fractured ends; they are also employed for securing perfect immobility of the parts to which they are applied in other cases, as in diseased joints, after resection of joints, &c.

Ordinary splints are composed of wood carved to the shape of the limb, and padded; the best pads being made out of old blankets, which should be cut into strips long and wide enough to line the splints, and laid in sufficient number upon one another to give the requisite softness. The splints should be firmly bound to the previously bandaged limb with pieces of bandage, or with straps and buckles; care being taken that they are put on sufficiently tight to keep the parts immovable, and to prevent muscular spasm, but not so tight as to induce discomfort. Gutta percha, sole-leather, or pasteboard, after having been softened in boiling water, may in some cases advantageously take the place of wooden splints. They must be applied when soft to the part they are intended to support, so as to take a perfect mould, and then be dried, stiffened, and, if necessary, lined. An account of the more complicated kinds of splint required in certain cases, as Macintyre's Splint, Liston's Splint, &c., may be seen in any illustrated catalogue of surgical instruments.

The ordinary splint is now to a great degree superseded by immovable bandages, which consist of the ordinary bandage saturated with a thick mucilage of starch, or with a strong solution of a mixture of powdered gum-arabic and precipitated chalk, which, when dry, form a remarkably light but firm support. As, however, these bandages require some hours to dry and become rigid, means must be used to counteract any displacement of the limb in the interval. On this account, many surgeons prefer the plaster of Paris or gypsum bandage, which is applied in the following manner: the limb being protected by a layer of cotton-wool, a bandage composed of coarse and open material, into which as much dry powdered gypsum as possible has been rubbed, must be immersed in water for about a minute, and then rolled around the limb in

in spiral manner, just as an ordinary bandage; after every second or third turn of the bandage, the left hand of the surgeon should be plunged into water, and smeared over the part last applied. When the whole has been thus treated, the exterior of the bandage should be smeared over with a paste of gypsum and water until a smooth surface and complete rigidity have been attained—a process not occupying more than ten minutes or a quarter of an hour. In a case of simple fracture, where no surgical aid is at hand, any non-professional person of ordinary intelligence might apply this bandage, extreme care being taken that the ends of the broken bone are in their proper position.

SPLÜ'GEN, a mountain of the Lepontine Alps, in the Grisons, Switzerland, whose summit, 9600 feet high, bears the name of the Tombenhorn. The pass of the Splügen, connecting the south-east of Switzerland with the region of Italy round Lake Como, is at its highest point 6940 feet above the sea, and in its present condition is the work of the Austrian government (1823). The southern or Italian descent has three great 'galleries'—i. e., covered portions of the pass constructed of solid masonry, and intended to protect the road from avalanches. They are the longest on any Alpine high-road. When Marshal Macdonald conducted the French army of reserve across the S. by the old path, 27th November—4th December 1800, he lost severely in men and horses from the fall of avalanches.

SPOHR, LUDWIG, an eminent German musical composer and violinist, son of a physician of Brunswick, and born in that town in 1784. He began his violin studies in boyhood; at the age of twelve, he played a violin concerto of his own at the court of Brunswick; and at thirteen he obtained an appointment as chamber-musician to the duke. A few years later, he made a musical tour through Russia and Germany, giving concerts, and acquiring a high reputation as a performer on the violin. In 1804, he became music director at the court of Saxe-Gotha, and held afterwards for several years the office of Music Director of the Theater an der Wien at Vienna. He visited Italy in 1817, Paris in 1819, and in 1820 appeared in London, where he was received with great applause at the Philharmonic Society's concerts, and produced two symphonies and an overture. In 1823, he became Kapellmeister at the court of Hesse-Cassel, which post he continued to hold till 1857, when he retired from professional life. He died in 1859. S.'s musical works include seven operas—*Faust*, *Jessonda*, *Zemira und Azor*, *Der Zweikampf der Geliebten*, *Der Berggeist*, *Peter von Albano*, and *Der Alchymist;* three oratorios, *Die letzten Dinge*, *Des Heiland's letzte Stunden*, and *Der Fall Babylons;* various masses, psalms, and hymns, six grand symphonies, four overtures, besides nonettes, quartetts, violin concertos, sonatas for violin and harp, fantasias, and rondos. *Die letzten Dinge*, or Last Judgment, is a very grand and very attractive work; so also is *Der Fall Babylons*, first produced at a Norwich musical festival. Of his operas, the most esteemed are *Faust* and *Jessonda*, the latter remarkable for its successful embodiment of the spirit of oriental poetry. His songs are rather deficient in broad and decided melody; but his instrumental works occupy a very high place in the estimation of musicians, more especially the C minor symphony, and the symphony known as *Die Weihe der Töne*. As a violinist, S.'s purity of tone and high finish have never been surpassed, and his *Violinschule* is the best and most complete work on violin playing ever written.—See *The Autobiography of L. Spohr;* translated from the German (Lond. 1864).

SPOLE'TO (Latin, *Spoletium*), a city of Italy, province of Umbria, is situated on a rocky hill, 61 miles north-north-east of Rome. Pop. (1872) 20,748. It is commanded by a strong citadel, which is built on a separate hill, divided from that on which the town stands by a deep gorge, crossed at an immense height by a bridge and aqueduct. The streets are steep, narrow, and dirty. S. has a fine cathedral, built in the time of the Lombard dukes, and containing many interesting works of art. The churches of St Dominico, San Giovanni, the collegiate church of San Pietro, and the palace of the ancient dukes of S., are also worthy of being mentioned. The ancient *Spoletium* had its origin in a Roman colony which was planted here about 240 B. C.; and during the second Punic War, Hannibal is said to have been repulsed by the colonists in an assault which he made on the town (217 B. C.), after the battle of Thrasymene. Under the Lombard dukes, it became the capital of an independent duchy. In 1860, it was taken by the Italians from a body of Irish mercenaries in the service of the pope, and now forms a part of the Kingdom of Italy. S. contains many interesting Roman remains, as also a ruin which goes under the name of the Palace of Theodoric. It has manufactures of woollens and hats.

SPO'NDIAS. See HOG PLUM.

SPONGE (*Spongia*), a genus which originally included all the numerous genera and species of the family *Spongiadæ*, all of which are still commonly spoken of by naturalists as sponges, although in its more popular sense that term is limited to a few kinds, or to their fibrous framework. The sponges are creatures of very low organisation, concerning which there has been much difference of opinion, whether they ought to be referred to the animal or to the vegetable kingdom. Naturalists are now generally agreed in regarding them as animals. They are, perhaps, the very lowest of *Protozoa*. They are attached, like plants or zoophytes, to rocks or other substances in water; most of them are marine. They consist of a glairy or gelatinous substance (*Sarcode*), and of a framework, which is often formed of a horny, elastic substance (*Keratose*), in fibres growing from a broad base, anastomosing and intimately connected together, or consists of calcareous, or more generally,

Living Sponge.

siliceous spicules, imbedded in the gelatinous mass, and exhibiting great variety of form and arrangement. These spicules do not consist of mere mineral matter, but in part of animal matter, by the growth of which their term is determined. They are most beautiful microscopic objects, and

spicules of different forms are sometimes found in the same species, sometimes lying close together in bundles, sometimes straight or slightly curved, sometimes in the shape of needles pointed at one end, or at both; sometimes of needles radiating from a centre; whilst some have a head at one end, like a pin, some have grapnel-like hooks at the ends. Some of the species with horny framework, have spicules imbedded in it; some have them implanted in the fibres; some are destitute of them. There is a beautiful West Indian species, *Dictyocalyx pumiceus*, in which the siliceous matter becomes itself a fibrous network, and is so fine and transparent as to resemble spun glass. In a living state, many sponges exhibit lively colours, from the presence of some colouring matter, or from iridescence. Their gelatinous substance has a fish-like odour. If detached portions of it are examined under the microscope, variable processes may be seen in motion, as in the *Amœba* or *Proteus* (q. v.). Sponges may be regarded as aggregations of *Amœbæ*, or rather of *Infusoria flagellata* (Clark), but individuality is soon lost when individuals of the same species are brought together. They coalesce into one. And if a sponge is divided by the knife, the parts, placed together, very quickly reunite, even if not in their former relation to each other. But parts of different species never unite in this way, however closely placed together. Sponges have never been observed to exhibit irritability. At first, they are like separate *Amœbæ;* but after they become fixed to a spot, increase by a kind of gemmation, like zoophytes. They assume very various forms, which, as well as the peculiarities in the structure of the framework, are characteristic of the different genera and species. Some are nearly globular; some cup-shaped, top-shaped, conical, cylindrical, thread-like, &c.; some are simple, and some branched.

The surface of a living sponge is generally covered with minute pores, through which water is imbibed, carrying with it both the air and the organic particles necessary for the support of life. The pores are supposed to be permanent in many of the sponges, and the currents which enter through them to be produced by cilia, although these have as yet been detected only in a few species. But in those of the very lowest organisation, the pores seem to be formed for the occasion, just as the *Amœba* opens anywhere to admit food within its substance. In *Spongilla fluviatilis*, a small fresh-water species found in Britain, the opening and closing of each pore occupies less than a minute, and the pores do not open simultaneously, but in irregular succession, and apparently never again in precisely the same spot. No trace of the pore remains for an instant after its closing, nor is there any indication of the point where a new one is to open. The water which enters by the pores passes out of some sponges by a single orifice, which serves for the whole mass; others have numerous orifices (*oscula*) which are permanent, and are much larger than the pores by which the water is imbibed, the whole mass being pervaded by canals which lead from the pores to these orifices, from which, under the microscope, a constant discharge of water may be seen taking place, minute opaque particles being carried along with its current. These particles are not only fæcal matter, but gemmules and ova.

A B

Structure of *Grantia compressa*:

A. portion shewing general arrangement of triradiate spicules and intervening tissue, magnified; B. small portion highly magnified, shewing ciliated cells.—From Carpenter *On the Microscope*.

Reproduction takes place both by gemmation and by true ova. Many of the gemmules go to increase the sponge-mass; but the greater part finally become detached, and are carried out into the water, to settle down in a new locality. Mr Huxley has detected true ova and sperm-cells imbedded in the substance of sponges.

The sponges employed for domestic and other purposes derive their value from the elasticity and compressibility of their fibrous framework, divested of the glairy substance, and its power of imbibing fluids. The absence of spicules is essential to a useful sponge. The kinds fit for use are found in the seas of warm climates. Some small species of sponge live at great depths. One has been brought up in the Gulf of Macri from a depth of 185 fathoms. Numerous species of sponge are very abundant on many parts of the British coasts.

Fossil remains of sponges are found in many rocks, and of horny, fibrous kinds, as well as of those with calcareous or siliceous framework.

Several species of sponge are in use for economical purposes. Two species are chiefly brought from the Levant, and a very inferior one from the West Indies and coast of Florida. The trade in sponge is very considerable; it is carried on chiefly by the Turks and the inhabitants of the Bahama Islands. The number of men employed in the Ottoman sponge-fishery is between 4000 and 5000, forming the crews of about 600 boats. These boats find their chief employment on the coasts of Candia, Barbary, and Syria. The sponge is obtained by diving, the diver taking down with him a flat piece of stone of a triangular shape, with a hole drilled through one of its corners; to this a cord from the boat is attached, and the diver makes it serve to guide him to particular spots. When he reaches the growing sponges, he tears them off the rocks, and places them under his arms; he then pulls at the rope, which gives the signal to his companions in the boat to haul him up. The value of sponges collected in Greece and Turkey is from £90,000 to £100,000 annually. The Greeks of the Morea, instead of diving, obtain sponges by a pronged instrument; but the sponges thus collected are torn, and sell at a low price. The best sponges are obtained on detached heads of rock in 8 or 10 fathoms water.

The sponges of the Bahamas and other West Indian islands are of a larger size and coarser quality; but large quantities are gathered; and about 215,000 lbs., worth £17,000, are sent annually to Great Britain. The sponges are torn from the rocks by a fork at the end of a long pole. To get quit of the animal matter, they are buried for some days in the sand, and then soaked and washed.

The domestic uses of sponge are familiar to every one. It is also of great value to the surgeon, not only for removing blood in operations, but for checking hæmorrhage. Burnt sponge was once a

valued remedy for scrofulous diseases and goitre; but iodine and bromine, from which it derives all its value, are now administered in other forms.

SPO'NSOR (Lat. one who promises), the name given in theological use to a Godfather or Godmother (q. v.). The name is derived from the circumstance, that in baptism or confirmation, and especially in infant baptism, the sponsor is understood to make certain promises or engagements in the name, and on the part of the person baptised or confirmed. The idea of sponsorship is entirely rejected not only by Baptists, but generally also by Presbyterians and Independents.

SPONTANE'ITY, the name for the doctrine, referring to the Human Mind, that muscular action may, and does, arise from purely internal causes, and independent of the stimulus of sensations. It had long been the tacit assumption in Mental Philosophy, that we are never moved to action of any kind, except under the stimulation of some feeling, some pleasure or pain, or some end in view. To this is now opposed the doctrine of the Spontaneous commencement of movements under certain circumstances; which, however, does not exclude, but only supplements, the operation of the feelings in stimulating movements, as in the ordinary course of voluntary action. The doctrine supposes that the nerve-centres, after repose and nourishment, acquire a fulness of vital energy, which discharges itself in the play of movement, without any other occasion or motive; the addition of a feeling, or end, enhances and directs the activity, but does not wholly create it.

Of the various proofs and illustrations of Spontaneity, perhaps the most striking is that furnished by the movements of young animals of the active species. A young dog or kitten shews a degree of activity out of all proportion to any feeling to be gratified, or any end to be served; we can interpret it only as internal energy seeking vent, irrespective of the pursuit of pleasure or the avoidance of pain—in other words, the action of the will. When the accumulated energy is expended, the animal falls back into a state of repose, and is then roused only by the stimulus of sensation. The state called 'freshness' in a horse, for example, is a state of superabundant and irrepressible activity. Children go through the same phase: after rest or confinement, they burst forth incontinently into some form of active excitement, of which a part may be considered as pure spontaneity, while part may be owing to sensation.

The doctrine is well fitted to express the difference between the active and the sensitive temperaments; for, if it were true that action is in proportion to the stimulation of the feelings, the most susceptible characters would be the most active. But, in point of fact, the active temperament is manifested by a profusion of activity for its own sake, with little circumspection or regard to consequences; and constitutes the restless, bustling, roughshod, energetic, and enterprising disposition of mind, as seen in sportsmen, soldiers, travellers, &c.

The explanation of the growth of the Will (q. v.), or voluntary power, involves the spontaneous beginning of movements.—See Bain on *The Senses and the Intellect*, 2d edit., p. 76.

SPONTA'NEOUS COMBU'STION is a phenomenon that occasionally manifests itself in mineral and organic substances. The facts connected with the spontaneous ignition of *mineral* substances are well known to chemists, and some of them have been already described in the article PYROPHORUS (q. v.). Ordinary charcoal does not undergo combustion in air under a temperature of 1000°, but in some states it is liable spontaneously to acquire a temperature which may lead to unexpected combustion. Thus, lamp-black impregnated with oils, which contain a large proportion of hydrogen, gradually becomes warm, and inflames spontaneously. According to M. Aubert, Chevallier, and other French observers, recently-made charcoal, in a state of fine division, is liable to be spontaneously ignited without the agency of oil; but we are not aware that this phenomenon has been observed in this country. There have been many instances of the spontaneous ignition of coals containing iron pyrites, (q. v.) when moistened with water. The pyrites which most readily give rise to spontaneous combustion are those in which the protosulphide is associated with the bisulphide of iron; and these occur in the Yorkshire coals from Hull, and in some kinds of South Wales coal. Sulphur has no tendency to spontaneous combustion, but Dr Taylor refers to an instance that came to his own knowledge, in which there was reason to believe that the vapour of bisulphide of carbon in an india-rubber factory was ignited by solar heat traversing glass. Phosphorus, when in a dry state, has a great tendency to ignite spontaneously, and it has been observed to melt and take fire (when touched) in a room in which the temperature was under 70°. The ordinary lucifer-match composition is luminous in the dark, in warm summer nights, which shews that oxidation, and therefore a process of heating, is going on. Hence, large quantities of these matches kept in contact may produce a heat sufficient for their ignition. 'I have seen them ignite,' says Dr Taylor, 'as a result of exposure to the sun's rays for the purpose of drying.'—*Principles and Practice of Medical Jurisprudence*, 1865, p. 603.

From these cases occurring in the mineral kingdom, we pass to the consideration of spontaneous combustion in *organic* substances. Passing over the accidents that may result from the admixture of strong nitric or sulphuric acid with wool, straw, or certain essential oils, and which, if they occur, are immediate and obvious, we have to consider the cases in which, 'without contact with any energetical chemical compounds, certain substances—such as hay, cotton and woody fibre generally, including tow, flax, hemp, jute, rags, leaves, spent tan, cocoa-nut fibre, straw in manure-heaps, &c.—when stacked in large quantities in a damp state, undergo a process of heating from simple oxidation (eremacausis) or fermentation, and, after a time, may pass into a state of spontaneous combustion.'—Taylor, *op. cit.* p. 606. There is undoubted evidence that hay and cotton in a damp state will occasionally take fire without any external source of ignition. Cotton impregnated with oil, when collected in large quantity, is especially liable to ignite spontaneously; and the accumulation of cotton-waste, used in wiping lamps and the oiled surfaces of machinery, has more than once given rise to accidents, and led to unfounded charges of incendiarism. Dr Taylor relates a case in which a fire took place in a shop 'by reason of a quantity of oil having been spilled on dry sawdust.' According to Chevallier, vegetables boiled in oil furnish a residue which is liable to spontaneous ignition; and the same chemist observes that all kinds of woollen articles imbued with oil, and collected in a heap, and hemp, tow, and flax when similarly treated, may ignite spontaneously. In the case of Hepburn *v.* Lordan, which came before Vice-chancellor Wood in January 1865, and was carried by appeal before the Lords Justices in the following month, an attempt was made to prove that wet jute was liable to undergo spontaneous combustion; and the great fire at London Bridge in 1861 was referred

to the spontaneous combustion of jute in its ordinary state. With regard to the latter hypothesis, Dr Taylor remarks that it is wholly incredible, and from experiments which he made for the defendants in the above lawsuit, and on other grounds, he holds that there is no evidence of moist jute undergoing spontaneous combustion; but, he adds, although no cases are recorded, it is probable that jute, cocoa-nut fibre, and linen and cotton rags, imbued with oil, might undergo this change. Dry wood is supposed by Chevallier and some other chemists to have the property of igniting spontaneously. Deal which has been dried by contact or contiguity with flues or pipes conveying hot water or steam at 212°, is supposed to be in a condition for bursting into flame when air gets access to it; and the destruction of the Houses of Parliament, and many other great fires, have been ascribed to this cause; but from the experiments of Dr Taylor (*op. cit.*, p. 615) this view must be regarded as untenable.

It is still an open question whether such organic nitrogenous matters as damp grain or seeds of any kind ever undergo spontaneous combustion. In a case recorded in the *Annales d'Hygiène* for 1841, MM. Chevallier, Ollivier, and Devergie drew the conclusion that a barn had caught fire from the spontaneous combustion of damp oats which were stored in it. No such cases are known to have occurred in this country.

The subject of the article is of extreme importance, not only because it may cause great destruction of life and property, but because it may lead to unjust charges of incendiarism.—For further details regarding it, the reader is referred to Graham's 'Report on the Cause of the Fire in the *Amazon*,' in the *Quarterly Journal of the Chemical Society*, vol. v. p. 34; to the article 'Combustion' in Watts's *Dictionary of Chemistry*, vol. i.; and to the elaborate chapter on this subject in Taylor's *Principles and Practice of Medical Jurisprudence.*

SPONTANEOUS COMBUSTION OF THE HUMAN BODY. In medico-legal works, cases are recorded, generally of a somewhat ancient date, in which it was supposed that the body was either spontaneously consumed by inward combustion, or acquired such extraordinary combustible properties as to be consumed when brought into contact with fire. The following is the first of one of the cases on record. It rests on the authority of Le Cat, a distinguished surgeon of his time, and is stated to have occurred at Rheims in 1725. The remains of a woman named Millet were found burned in her kitchen, about eighteen inches from the open fireplace. Nothing was left of the body, except some parts of the head, of the legs, and of the vertebræ. Suspicion was excited against the husband, and a criminal inquiry was instituted; but learned experts reported that the case was one of spontaneous combustion, and the prisoner was acquitted. The facts are explicable on the supposition, that the clothes of the deceased woman were accidentally ignited; and although the almost complete destruction of the body appeared to the medical men of that time to be inconsistent with the ordinary effects of fire, subsequent observations have shewn that this is an error. In reference to this case, Liebig observes that it is easy to see that the idea of spontaneous combustion arose at a time when men entertained entirely false views on the subject of combustion, its essence, and its cause. What takes place in combustion generally has only been known since the time of Lavoisier (about 84 years ago), and the conditions which must be combined in order that a body should continue to burn, have only been known since the time of Davy, or for little more than half a century. From the time when the case of Millet occurred to the present day, probably somewhat over 50 supposed cases have been recorded. (In an article published on the subject by Dr Frank of Berlin in 1843, 45 cases are adduced.) From an analysis of all the cases on record up to 1851, Liebig arrives at the conclusion that the great majority agree in the following points: '1. They took place in winter. 2. The victims were brandy-drinkers in a state of intoxication. 3. They happened where the rooms are heated by fires in open fireplaces and by pans of glowing charcoal, in England, France, and Italy. In Germany and Russia, where rooms are heated by means of closed stoves, cases of death ascribed to spontaneous combustion are exceedingly rare. 4. It is admitted that no one has ever been present during the combustion. 5 None of the physicians who collected the cases, or attempted to explain them, has ever observed the process, or ascertained what preceded the combustion. 6. It is also unknown how much time had elapsed from the commencement of the combustion to the moment when the consumed body was found.' —*Letters on Chemistry*, 3d ed., 1851, p. 282. Out of the 45 cases collected by Frank, there are only three in regard to which it is assumed that combustion took place when no fire was in the neighbourhood; and Liebig distinctly shews that these three solitary cases are totally unworthy of belief. With regard to the other cases, the writers who record them do not deny the presence of fire, but assume that the body was ignited by the fire, and then burned on like a candle or a bundle of straw, under similar conditions, till nothing but ashes or charcoal was left. These writers maintain that excess of fat, and the presence of brandy in the body, induce an abnormal condition of easy combustibility; but Liebig shews, by numerous illustrations, the utter fallacy of this view; and adds, as further evidence, 'the fact that hundreds of fat, well-fed brandy-drinkers do not burn, when by accident or design they come too near a fire. It may with certainty be predicted, that so long as the circulation continues, their bodies would not take fire, even if they held a hand in the fire till it was charred.' Spontaneous combustion in a living body is (he adds) absolutely impossible. Notwithstanding the wide promulgation of Liebig's views, the belief in the possible occurrence of spontaneous combustion seems not yet to have disappeared. In 1847, the body of a man, aged 71, and who was neither fat nor a drunkard, was found in bed in a state of combustion. Dr Nasson, who was commissioned to investigate the case, reported that the burning must have resulted from some inherent cause in the person —probably roused into activity by a hot brick that was placed at his feet; and Orfila is reported to have coincided in this opinion. This case is reported in the *Gazette Médicale*, September 4, 1847. On the 13th of June 1847, the Countess of Goerlitz was found dead in her bedroom, with the upper part of her body partly consumed by fire. The head was a nearly shapeless black mass, with the charred tongue protruding from it. The physician who was consulted could suggest no other explanation than that the body of the countess must have taken fire spontaneously, and not even by ignition of her dress by a candle. On this evidence, she was buried; but circumstances having led to the suspicion that she had been murdered by her valet Stauff (who had been detected in attempting to poison the count), her body was exhumed in August 1848, fourteen months after her death, and was subjected to a special examination by the Hesse Medical College, who reported that she had not died from spontaneous combustion. The case was then referred to Liebig and Bischoff, and their report was issued in

March 1850, when Stauff was put upon his trial. They found no difficulty in concluding that the body was wilfully burned *after death*, for the purpose of concealing the murder (either by strangulation or a blow on the head), which had been previously perpetrated. The prisoner was convicted, and subsequently confessed that he had committed the murder by strangulation, as indeed the protruded tongue might have suggested. Since that date, there has not been any case of alleged spontaneous combustion.—On this subject, the reader is referred for much curious and interesting matter to the various articles on 'Spontaneous Combustion' in the Medical Dictionaries and Encyclopædias; to Dupuytren's *Leçons Orales*, p. 513; to Liebig's *Letters on Chemistry*; and to Taylor's *Principles and Practice of Medical Jurisprudence*.

SPONTOO'N, a weapon bearing resemblance to a halberd, which, prior to 1787, was borne instead of a half-pike by officers of British infantry. It was a medium for signaling orders to the regiment. The spontoon planted in the ground commanded a halt; pointed backwards or forwards, advance or retreat; and so on.

SPOOL, in Spinning, a wooden reel for winding yarn upon. In sewing and lace-making machines, the spools are of metal, and their forms vary according to the requirements of the machine.

SPOO'NBILL (*Platalea*), a genus of birds of the Heron family (*Ardeidæ*), much resembling storks both in their structure and their habits, but distinguished by the remarkable form of the bill, which is long, flat, broad throughout its whole length, and much dilated in a spoon-like form at the tip. The species are not numerous, but are widely distributed. The only European species is the WHITE S. (*P. leucorodia*), rare in Britain, although in former times, before the draining of the fens in England, it was a more frequent summer visitor. It is common in Holland, in marshy districts throughout the northern parts of Europe and Asia in summer, and in the salt marshes of the coast of Italy in winter. It also inhabits Africa, and its range extends over the whole of that continent. It is gregarious, and the flocks of spoonbills generally make their nests in woods, in the tops of lofty trees. It is considerably smaller than the Common Heron. Its colour is white, slightly tinged with pink; the bill and legs are black. A curious convolution of the windpipe, in the form of the figure 8, is found on dissection in the adult S., but does not exist in the young. The flesh of the S. is said to be tender and of good flavour. The S. is easily tamed, is quiet and inoffensive, and feeds readily on any offal.—The ROSEATE S. (*P. ajaja*) is an American species; very abundant within the tropics, and found in the most southern parts of the United States. It is nearly equal in size to the White S., which it resembles in its habits. It is a beautiful bird, with plumage of a fine rose-colour, of which the tint is deepest on the wings; the tail-coverts crimson.

SPO'RADES. See ARCHIPELAGO and TURKEY.

SPORA'DIC (Gr. scattered) is a term applied to any disease that is naturally epidemic or contagious, when it attacks only a few persons in a district, and does not spread in its ordinary manner. The conditions on which the occurrence of epidemic or contagious diseases in a sporadic form depend are unknown. Amongst the diseases which occur in this form may be especially mentioned catarrh, cholera, dysentery, measles, scarlatina, and small-pox.

SPORE, in Botany, may be called the *seed* of a cryptogamous plant, as it serves the same purpose of reproduction as the seed of a phanerogamous or flowering plant, and after remaining for a time in a state of rest, is developed into a new plant on the occurrence of the necessary conditions. A spore, however, differs very much from the seed of a phanerogamous plant, as it always consists of a single cell, and therefore does not contain any *embryo* or rudiment of the future plant. In its formation, it corresponds rather with the grains of pollen in the anther of a flower. Spores are small, often so minute as to be invisible to the naked eye—many of them extremely minute, so that they may be wafted about unperceived. This, indeed, might be expected from the very small size of many of the cryptogamic plants themselves, as moulds and many other fungi. But even the spores of the largest ferns are very small. Spores often remain capable of germination for many years, and they seem to be capable of enduring much drought without destruction. They seem to germinate indifferently from any part of their surface, in which they differ essentially from the seeds of phanerogamous plants. In the parent plant, they are either scattered singly, or are united in a fruit-like envelope, which is generally known as a *Sporangium*, or *Spore-case*. In some plants, they are united in definite numbers, as of four (a *tetraspore*), surrounded by an envelope (*perispore*, or *sporidium*). The peculiar reproductive organ, which in some cryptogamous plants produces the spores, is called a *sporocarp*, or a *sporophore*. In many plants, as in mushrooms, the production of spores belongs exclusively to a part of the plant called the *hymenium*.

SPORTS, BOOK OF, the name popularly given to a Declaration issued by James I. of England in 1618, to signify his pleasure that on Sundays, after divine service, 'no lawful recreation should be barred to his good people, which should not tend to the breach of the laws of his kingdom and the canons of his church.' The sports specified were dancing, archery, leaping, vaulting, May-games, Whitsun-ales, morrice-dances, and the setting up of May-poles. The occasion of this proclamation was the conduct of some Puritan authorities in Lancashire, who, in illegally suppressing, instead of regulating, the customary recreations of the common people, had excited much discontent, and increased the influence of the Roman Catholics by giving a repulsive aspect to the Reformed religion. Although the Declaration was ordered to be read in the parish churches of the diocese of Chester, this order was not enforced, and the king's design was allowed to drop. Among the excepted unlawful sports were bear-baiting, bull-baiting, bowling, and interludes. Nonconformists and others not attending divine service at church were prohibited from joining in the sports, nor was any one allowed to go out of his own parish for that purpose, or to carry offensive weapons. By republishing this Declaration in 1633, and enforcing with great severity the reading of it by the clergy in their churches (see SABBATH), Charles I. and Laud excited among the Puritans a degree of indignation which contributed not a little to the downfall of the monarchy and the church. In 1644, the Long Parliament ordered all copies of it to be called in and publicly burned.—Heylin's *Hist. of the Sabbath and Life of Laud*, Fuller's *Church History*, D'Israeli's *Life of James I.*, Southey's *Book of the Church*, Hallam's *Constitutional History of England*, and Cox's *Literature of the Sabbath Question*.

SPOTTISWOOD, JOHN, Archbishop of St Andrews, son of John Spottiswood, Superintendent of Lothian, was born in the year 1565. He was educated at the university of Glasgow, and on his

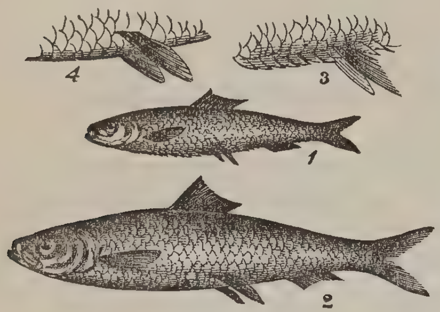
father's death, succeeded him as Parson of Calder. In 1601, he attended the Duke of Lennox as chaplain, when that nobleman was sent as ambassador to France by King James VI. When James succeeded to the English crown, S. accompanied him on his journey to London, and, soon after that event, on the death of Archbishop James Beaton, was appointed to the see of Glasgow. He was chosen Moderator of the General Assembly of the Scottish Church, which met at Glasgow in 1610, and completed the establishment of episcopal government, which James had laboured so long to accomplish. In October of that year, he was, along with the bishops of Brechin and Galloway, consecrated at London House by the Bishop of London and other English prelates. In 1615, he took a leading part in the examination of John Ogilvie, a Jesuit priest, who was apprehended at Glasgow, and hanged for refusing to disown the temporal power of the pope. The share he took in this matter was most discreditable to the archbishop. In the course of the same year, he was translated to the see of St Andrews. As primate of the Scottish Church, S. had now the chief management of ecclesiastical affairs, and great influence also in the civil government, and his rule was marked by uniform ability, and, with rare exceptions, by prudence and moderation. He presided at the Assembly which met at Perth in 1618, and sanctioned the five points of ecclesiastical discipline known as the Perth Articles. He was as much in favour with King Charles I. as he had been with King James, and at the coronation of that sovereign at Holyrood in 1633, he placed the crown on his head and anointed him. In 1635, S. was made Chancellor of Scotland, a dignity which no churchman had held since the Reformation; but in accepting an appointment so invidious to the nobles, he did not act with his usual discretion. He reluctantly entered into the king's unwise measures for the introduction of a liturgy into Scotland, and became one of the chief objects of popular dislike when the Covenanters acquired the ascendency. He soon found it necessary for his safety to retire to England, and in the end of 1638, at the king's request, he resigned the chancellorship. He protested against the lawfulness of the General Assembly which met at Glasgow in November of the same year, and was deposed and excommunicated by that body for alleged offences, which, so far as his private character was concerned, were improbable in themselves, and supported by no evidence whatever. The archbishop did not long survive the overthrow of the polity which it had been the work of his life to build up. He died at London on the 26th of November 1639, being then in the 74th year of his age. He had expressed a wish to be buried at Dairsie in Fife, where he had rebuilt the church after the English model, but this was found impracticable, and he was interred in Westminster Abbey. The writings of S. are his well-known *History of the Church of Scotland*, first published in 1655; a Sermon preached at the meeting of the Perth Assembly of 1618, which was published by Bishop Lindsay in 1621 in his account of the proceedings of that Assembly; and a Latin treatise, *Refutatio Libelli de Regimine Ecclesiæ Scoticanæ*, written in answer to a tract of Calderwood's, and published in 1620. The chief authorities for the biography of the archbishop are the Life ascribed to Bishop Duppa, prefixed to the folio editions of his *History*, and the Life by Bishop Russell, prefixed to the Spottiswood Society edition of the same work.

SPRAIN. A sprain or *strain* is a term employed in Surgery to designate a violent stretching of tendinous or ligamentous parts with or without rupture of some of their fibres. Sprains are very frequent in all the joints of the upper limbs, especially in the wrist and the articulations of the thumb. In the lower extremity, the ankle is the joint by far the most frequently affected; and this is accounted for anatomically by the small size of the articular surfaces, the great weight the astragalus (the bone presenting the lower articular surface) has to support, and the unyielding nature of the lateral ligaments. In slight sprains of this joint, the ligaments are only stretched or slightly lacerated, but in more severe cases they may be completely torn through. Sprains of the ankle are sometimes mistaken for fractures, and *vice versâ;* and the two injuries may co-exist. The pain and swelling sometimes make an accurate diagnosis difficult, especially if the patient is not seen for some time after the accident; and if any doubt exists, the case should be treated as for the more severe injury, since it is better that the treatment should be prolonged than that the patient should be maimed; and fortunately, that which is the proper treatment of a fracture is the best that can be employed for a sprain. Sprains of the knee are not uncommon, and are characterised by great swelling from effusion of fluid within the joint. Sprains of the back are not unfrequent accidents, and are the most serious of any, but in most cases it may be anticipated that after confinement in bed or on a sofa for two or three weeks, and with proper treatment, the patient will be able to walk, although he may feel stiffness and pain for several weeks longer. The treatment of sprains generally must be regulated by their severity. In a severe sprain, attended with much pain and inflammation, leeches should be applied, followed by hot-water fomentations, or the application of a hot linseed-meal poultice. In slighter cases, rest and cold lotions constitute sufficient treatment. In all cases of sprain of the extremities, thin pasteboard splints placed on the outer and inner surfaces of the joint, over a wet bandage previously laid round it, afford support to the part, and comfort to the patient. In sprains of the back, more decided antiphlogistic or lowering measures are required. 'After an active mercurial purge, a dose or two of Dover's Powder may be given, with salines at intervals. The diet ought to be spare. In those of vigorous constitution, the abstraction of blood may be required. Afterwards, nothing will conduce more to the comfort of the patient than well-managed fomentation of the back. Amendment will be denoted by the patient's turning in bed more freely, and seeking to sit up. At that period, stimulating liniments, or the application of the compound tincture of iodine, will be called for. When able to walk, he will be benefited by a warm plaster to his loins.'—Shaw on 'Injuries of the Back,' in Holmes's *System of Surgery*, vol. ii. p. 202.

SPRAINS, or STRAINS, are very common amongst horses, owing to the severe exertions required of them, often whilst they are young, and unprepared for such work. Various muscles, ligaments, and tendons are liable to strain, but none more frequently than the large tendons passing down the back of the fore-limbs. In slight cases, cold water continuously applied for several hours gives relief; but in all serious cases, diligent fomentation with water about the temperature of 100° is preferable; or the injured part may be swathed in a thick woollen rug, kept constantly moist and warm by frequent wetting with the hot water. Perfect rest is essential, and in order to insure the relaxation of the large tendons of the horse's limbs, he may in bad cases be kept slung for several days. Blisters, hot oils, firing, and all such irritants, are on no account to be used until the inflammation

subates, and the part becomes cool, and free from tenderness. Such remedies are then useful for causing the reabsorption of swelling, and perhaps also for invigorating the weakened part.

SPRAT (*Harengula sprattus*, formerly *Clupea sprattus*), a fish of the family *Clupeidæ*, very abundant on many parts of the British coast, and elsewhere in the northern parts of the Atlantic. It is smaller than the herring, being only about six inches in length when full grown, but much resembles it. It is, however, easily distinguished by the serrated belly, and by the position of the fins, the ventral fins beginning immediately beneath the first ray of the dorsal fin, and not beneath the middle of it, as in the herring and pilchard. Another easily observed distinction is the want of axillary scales to the ventral fins, which both the herring



Sprat and Herring:
1, sprat; 2, herring; 3, belly of sprat; 4, belly of herring.

and pilchard have. The dentition is also different, and on this account Valenciennes has constituted, for the S. and a number of other species, the new genus *Harengula*, characterised by having teeth on the jaws, tongue, palatines, and pterygoids, but no teeth on the vomer. The herring has teeth on the vomer. Valenciennes states also that the S. has only 48 vertebræ, whilst the herring has 56. Notwithstanding all this, an old opinion has recently been revived, and urged with some pertinacity on public attention, that the S. is the young of the herring, which, therefore, it is injurious to a more important fishery to capture. Except that it is not common to find sprats full of roe, nothing has been stated in support of this notion more to the purpose than that the serratures of the belly may possibly be a provision for the growth of the fish; a provision to which it may be remarked that nothing analogous appears in any province of nature. Nor is it wonderful that many sprats may be examined without roe being found, as the greater part of those taken on the British coasts have not attained their full size. Sprats abound especially on the coasts of Norfolk, Suffolk, Essex, and Kent in November and several following months. The net used for their capture has smaller meshes than the herring-net. Drift-net fishing is practised as for herring, and a method called *stow-boat* fishing, in which a large bag-net is suspended between two horizontal beams beneath the boat, and about a fathom from the bottom of the water; ropes from the ends of the upper beam enabling the fisherman in the boat to keep the mouth of the bag always open and against the tide. Vast quantities of sprats are taken in this way, so that they are used as manure by farmers, although London is also very largely supplied with them, and being sold at a very cheap rate, they are a favourite article of food of the poorer classes. The Firth of Forth also produces sprats—in Scotland, called *garvies*—so abundantly that they are sold both in Edinburgh and Glasgow by measure, and cheaper than any other kind of fish. But there are many parts of the British coast where the S. is rare, some of these being parts where the herring is plentiful. Notwithstanding its cheapness, the S. is a very fine fish, of flavour quite equal to the herring, although decidedly different. Dried sprats are a very common article of provision, and sprats are also sometimes salted. The *kilkies* brought from Riga and other ports on the Baltic, are sprats cured with spices; and many of the boxes of *Sardines* which are sent to market from the west coast of France, are really filled with sprats. The value of the S. does not seem to be as yet fully appreciated in Britain.—Very closely allied to the S. is another fish (*Harengula latulus*), the *Blanquette* of the French, which is caught in great abundance on some parts of the west coast of France.—Other species of *Harengula* are found in other seas. One of them (*H. humeralis*), which abounds in the West Indies, and southwards as far as Rio Janeiro, is much esteemed, but becomes dangerous at certain seasons, from some unknown cause.

SPREAD EAGLE. See EAGLE.

SPREE, a river of Prussia, rises near Ebersbach in the east of Saxony, on the borders of Bohemia, and after an irregularly winding, but generally north and north-western course of 220 miles, falls into the Havel (q.v.) at Spandau. It has all the peculiarities of a stream flowing through a low and marshy region—abounding in fish, and frequently expanding into lakes, the largest of which are the *Schwielochsee* and *Müggelssee*. Its banks are flat, sometimes sandy and wooded, and sometimes rich in meadow-pastures. It becomes navigable for small craft at Kosenblatt. The principal towns past or through which it flows are Bautzen, Spremberg, Kottbus, Lübben, Beeskow, and Berlin. Its trade is very considerable. By the Friedrich Wilhelm's or Müllrose Canal, it is connected with the Oder.

SPRING, a stream of water issuing from the earth. The source of springs is the rain and snow that falls from the clouds. Very little of the water precipitated in any district finds its way immediately by rivers to the sea; the great proportion is either evaporated from the surface of the earth, and, reabsorbed by the atmosphere, is employed by plants and animals, or sinks into the earth. All loose soils and gravels greedily absorb water, which descends until it meets with a stratum through which it cannot penetrate. A pit dug into the water-charged soil would speedily fill itself by draining the water from the soil. All rocks contain water; some retain it by capillary attraction, like a sponge, others hold it merely mechanically, and easily part with it. Chalk will absorb and retain one-third of its bulk of water; and sand, on the other hand, while it will absorb as much, will part with nearly the whole amount to a well dug in it. Argillaceous deposits and compact rocks are barriers to the passage of water, and cause the superincumbent pervious strata to become water-logged, where there is no outlet. Sometimes the edges of the strata are exposed on the sides of a valley, and permit the free escape of the contained water, which pours from them over the neighbouring land. But rents and fissures, as well as inequalities on the surface of the impervious beds, give the water a circumscribed course, and cause it to issue in springs.

The water, as it percolates through the earth, always becomes more or less charged with foreign

matter, owing to its solvent property. Carbonate, sulphate, and muriate of lime, muriate of soda, and iron, are the most common impurities in spring-waters; magnesia and silica also frequently occur. These substances, from the evaporation of part of the water, or the escape of the carbonic acid gas, by which so large a quantity is often held in solution, are frequently deposited on the margins of the springs, or in the courses of the streams flowing from them. Such deposits are found in all so-called petrifying springs; and the hot wells of Iceland and the Azores are surrounded with basins formed of siliceous sinter which has been derived from the water. When the foreign ingredients have medicinal qualities, the springs are known as Mineral Waters (q. v.).

Springs are either associated with the superficial strata, or rise from a considerable depth. *Surface-springs* occur where the absorbent surface-deposits rest on an impervious bed, which prevents the further

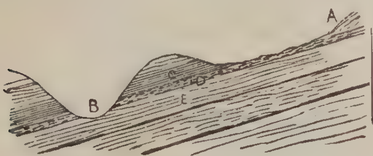


Fig. 1.

downward progress of the water, or where the beds through which the water flows are near the surface, as shewn in fig. 1, where C and E are impervious clay-beds, and D is a bed of sand or gravel, which in the upper portion is exposed on the surface, or is only overlaid by loose soil, and after being covered for some distance by the clay-bed C, makes its appearance again at B, where the valley cuts it through: here the water collected over the area, A, is discharged. Surface-springs, depending as they do so directly on the rain for supplies, are very variable in the amount of water they deliver. They frequently fail entirely in the summer, and always after great droughts. Their temperature varies with that of the district where they exist, being warm in summer, and cold in winter, as they do not penetrate below that plane in the earth's crust which is affected by the seasonal changes in temperature.

When the bed which forms the reservoir for the spring is at such a distance from the surface as to be beyond the zone of season changes, and yet within that which is influenced by the climate, the water has a temperature equal to the mean temperature of the locality where it springs. Such springs have generally a large area for the collection of the superficial water, and are consequently regular in the quantity of water they give out. They are brought to the surface by means of faults. The celebrated Well of St Winifred at Holywell, in Flintshire, rises through a fault in the Coal Measures. It discharges at the rate of about 4400 gallons per minute, being the most copious spring in England, and the water, in its short course of little more than a mile to the sea, is used to propel 11 mills.

Most deep wells have a lower origin than the zone of climate temperature, which in Britain is between 200 and 300 feet. It is well known that a regular increase in the temperature is observed after this zone is passed, equal to 1° of F. for every 55 feet. As wells have a temperature corresponding to that of the strata from which they spring, it follows that the deeper the spring the higher will be its temperature. Local conditions may affect the thermal state of springs, as in the case of the Geysers in the active volcanic district in Iceland, and the warm springs near Naples; but where no such local influences exist, the depth of the bed from which the water comes may be to some extent estimated by its temperature. Thermal springs occur in Britain at Matlock (66° F.) and Buxton (82°) in Derbyshire, at Bath (117°) in Somerset, and at Clifton (76°) in Gloucestershire. Artificial communications have been opened with deep-lying strata, by which the water they contain has been brought to the surface, and in these the temperature is found to increase in proportion to the depth of the bore. See Artesian Wells. The most remarkable thermal springs are the Geysers of Iceland, which are fully described under Geyser.

Intermittent springs are sometimes produced by the ebb and flow of the tide, as at Richmond, where the rise at high water is seen in the wells which flow from the arenaceous strata on the banks of the Thames; and sometimes they depend on the supply of rain-water. But there is a kind of spring the intermittences of which are believed to be owing to the structure of the internal cavities from which the supply is obtained. This will be more easily understood by a reference to the accompanying diagram (fig. 2). The large reservoir, A, is fed by the rain percolating through the rock. It communicates with the surface by a siphon-shaped tube, BCD. As long as the water in the reservoir is at a lower level than the arch of the siphon at C, no

Fig. 2.

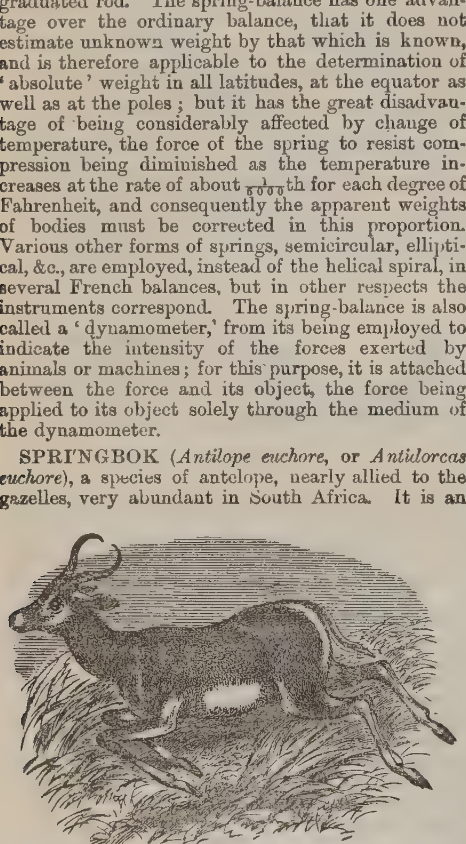
water can escape; but as soon as it reaches that level, the whole of the water in the cavity will be drawn off, the spring will then cease, and will only make its appearance when sufficient water has accumulated to permit the siphon again to act.

SPRING-BALANCE, The, for determining the weight of bodies, consists of a spring in the form of a cylindrical coil, through which passes freely a graduated bar, having a hook attached to its under end, and a plate to its upper (fig.). The spring is enclosed in an oblong or cylindrical box, quite closed except at the bottom, where there is a hole just large enough to allow the free passage up and down of the graduated bar. When the instrument is to be used, it is suspended by a ring fastened to the upper part of the box; the weight to be estimated is then hung on the hook, and pulls down the rod, the button or plate at the top of which compresses the helical spring within against the bottom of the box; and the graduation corresponding to this amount of compression of the spring, is read off at that part of the rod which just shews itself outside. In another form of the spring-balance, known as Salter's Balance, a brass index plate is attached to the side of the box, and a

Spring-balance.

vertical slit through both plate and box is made from top to bottom; the weight is in this case read off on the plate by a pointer fastened to the spring, and protruding through the slit. In a third form, known as Martin's 'index weighing-machine,' the interior rod, instead of being graduated, is furnished with a rack on one side; this rack moves a toothed-wheel fastened on the side of the instrument; and this wheel, again, has at one extremity of its axis a long index, which, on the wheel being put in motion, traverses a circular dial-plate, on which the graduations of weight are marked. The advantage of this last construction consists in the arrangement of the size of the toothed-wheel to that of the dial-plate, so that, since the toothed-wheel and index make a complete revolution simultaneously, a small motion of the former may produce a large motion of the latter, and the weight of the body be much more accurately read off than can be done directly on the graduated rod. The spring-balance has one advantage over the ordinary balance, that it does not estimate unknown weight by that which is known, and is therefore applicable to the determination of 'absolute' weight in all latitudes, at the equator as well as at the poles; but it has the great disadvantage of being considerably affected by change of temperature, the force of the spring to resist compression being diminished as the temperature increases at the rate of about $\frac{1}{5000}$th for each degree of Fahrenheit, and consequently the apparent weights of bodies must be corrected in this proportion. Various other forms of springs, semicircular, elliptical, &c., are employed, instead of the helical spiral, in several French balances, but in other respects the instruments correspond. The spring-balance is also called a 'dynamometer,' from its being employed to indicate the intensity of the forces exerted by animals or machines; for this purpose, it is attached between the force and its object, the force being applied to its object solely through the medium of the dynamometer.

SPRI'NGBOK (*Antilope euchore*, or *Antidorcas euchore*), a species of antelope, nearly allied to the gazelles, very abundant in South Africa. It is an



Springbok (*Antilope euchore*).

extremely beautiful creature, of graceful form, and fine colours. It is larger than the roebuck, and its neck and limbs much longer and more delicate. The general colour is fulvous brown on the upper parts, pure white beneath, the colours separated on the flanks by a broad band of deep vinous red. The whole head is white, except a broad brown band on each side from the eye to the mouth, and a brown spot in the centre of the face. Two curious folds of skin ascend from the root of the tail, and terminate near the middle of the back; they are usually closed, but open out when the animal is bounding, and disclose a large triangular white space which is otherwise concealed. The S. derives its name from the prodigious leaps which it takes either when alarmed or in play, often to the height of 7 feet, and sometimes of 12 or 13 feet. Its ordinary residence is in the *karroos* or arid sandy plains; but when all pasture there is burned up, immense herds congregate together, and migrate to more fertile regions, often devastating the fields of the colonist. Mr Pringle speaks of seeing the country near the Little Fish River specked with them as far as the eye could reach, and estimates the number in sight at once as not less than 25,000 or 30,000. Captain Cumming describes a still more extraordinary scene, a vast herd pouring through an opening among hills, in one living mass, half a mile in breadth, and so continuing for hours together. So dense are these herds sometimes in their migrations, that the lion or the leopard, which ordinarily hangs on their skirts with a view to prey, is taken prisoner, and compelled to march along in the midst. The strongest animals are generally foremost, but when satiated with food, they fall behind, and others, hungry and active, take their place. When taken young, the S. is easily tamed, and becomes very familiar, troublesome, and tricky.

SPRINGER. See ARCH.

SPRINGER, a kind of dog, regarded as a variety of the Spaniel (q. v.). It is small, elegant, usually white, with red spots, black nose and palate, long pendent ears, and small head. Its aspect is very lively, and its manners equally so. It is used by sportsmen for raising game in thick and thorny coverts. There are several breeds or sub-varieties.

SPRI'NGFIELD, a city of Massachusetts, U. S., on the east bank of Connecticut River, 98 miles west-by-south of Boston. It is the seat of many important manufacturing establishments, which are supplied with water-power by the falls of Mill River, and among which is the United States Armory, the most extensive in the Union, situated on an eminence called 'Armory Hill,' numerous foundries, manufactories of cotton and woollen goods, machinery, cotton-presses, steam-engines, fire-engines, locomotive-wheels, railway-carriages, India-rubber goods, &c. At the immense station-house of S. three important lines of railway meet. S. has a large city hall, 25 churches, city library and museum, a superior public-school system, including a high-school, 8 banks, and 2 daily and 3 weekly newspapers. The town, one of the finest in New England, was settled in 1635. Pop. (1860) 15,199; (1870) 26,703; (1880) 33,340.

SPRINGFIELD, the capital of Illinois, U. S., is built on a vast prairie, near the middle of the state, 188 miles south-west of Chicago, on the Chicago, Alton, and St Louis Railway. It is regularly laid out with broad streets and gardens, which have given it the name of the 'Flower City.' The State House, built in a great central square, is the principal architectural ornament. S. is also the seat of the Illinois state university, and has 13 churches, 3 newspapers, 4 banks, with foundries and flouring-mills, and is the entrepôt of a rich agricultural country. Pop. (1860) 6499; (1880) 19,743.

SPRINGFIELD, a city of Ohio, U. S., on Lagonda Creek and Mad River, 43 miles west of Columbus. It contains 10 churches, the Wittenburg Lutheran College, 1 daily and 3 weekly newspapers, 5 banks, flouring-mills, iron-foundries, woollen and paper mills, extensive railway connections, and a large trade in corn, cattle, and hogs. Pop. (1860) 7202; (1870) 12,652; (1880) 20,730.

SPRINGS, MECHANICAL, are very variously constructed for different purposes. The simplest form

of spring is a piece of elastic metal wire, rolled on a mandrel, so as to form a continuous single cylindrical coil of any length needed. Clock and watch springs are made in flat coils, thin bands of steel being used. The *balance-spring* of watches is, however, made of fine wire often thinner than hair. Coach-springs are formed of a series of curved narrow plates of steel of different sizes, placed one over the other, the largest being at the bottom, and the others in regular succession according to size, the whole being held together with nuts and screws. These are some of the commonest forms, but very many others are in use.

SPRIT (*spriet*, Dutch; old English verb, *sprit*, to sprout or spring out) means a pole or spar. The word occurs most frequently in the compound, bowsprit, which explains itself. When used alone, a sprit is a diagonal yard for sustaining a quadrilateral (usually square) fore-and-aft sail. The sprit's heel is held on the mast in a ring of rope,

Spritsail.

called a 'snotter,' and its head reaches to the after upper corner of the sail. The sail thus extended is a spritsail, and is frequently employed in boats.

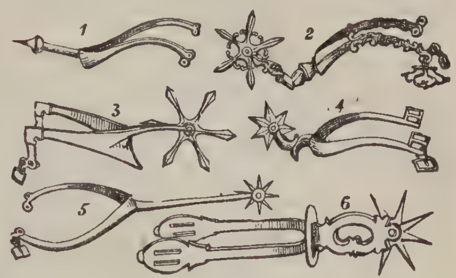
SPRUCE. See FIR.

SPRUCE, ESSENCE OF, AND SPRUCE-BEER. The essence of spruce is obtained by boiling the green tops of the Black Spruce (*Abies nigra*) in water, and then concentrating the decoction by another boiling without the spruce tops. The young shoots of this fir, like most others of its family, are coated with a resinous exudation, which is dissolved in the water. The beer is made by adding the essence of spruce to water in which sugar or treacle has been dissolved, in the proportion of about four ounces of essence of spruce to ten pounds of sugar, or three quarts of treacle, and ten or eleven gallons of water, with about half a pint of yeast. Various spices are used for flavouring. A similar beverage is made largely in the north of Europe, from the buds of the Norway Spruce (*Abies excelsa*), and is known as Black Beer, that of Danzig being the most famous. The Antiscorbutic Beer of the Russian Army Pharmacopœia is made by mixing spruce tops and fresh horse-radish root with common beer, ginger and *Calamus aromaticus* being added for flavouring, and after fermentation, a little cream of tartar, tincture of mustard, and proof spirit.

SPUI'LZIE, in the Law of Scotland, is the taking away of the movable goods in the possession of another against his will, and without any legal authority. Whenever a spuilzie has been committed, an action of damages may be brought against the wrong-doer, not only for restoration of the goods, but for all the profits which the owner might have made with the goods in the meantime. This action must be brought within three years, but the action for ordinary damages may be brought within forty years.

SPU'NGING-HOUSES are, in the Law of England, the private houses of the bailiffs, who may detain there a debtor who has been arrested for debt for twenty-four hours, to admit of his or his friends' arranging to settle the debt; and the name is derived from the extortion often practised in this state on the debtor.

SPUR, an apparatus fastened to the heel of a horseman, for goading the horse. It is much less



Various Kinds of Spurs.
(From Antiquarian Museum, Edinburgh.)

1, bronze prick spur found at Linlithgow Palace; 2, iron spur found near Bannockburn; 3, bronze spur found at Colchester; 4, brass spur found at Culloden; 5, spur found at Halidon Hill; 6, spur found in making a drain in High Street, Edinburgh.

used than formerly. All cavalry soldiers wear spurs; but their use, except in the heat of an actual charge, is discouraged as much as possible. In the days of chivalry, the use of the spur was limited to knights, and it was among the emblems of knighthood. To win his spurs, was for a young man to earn knighthood by gallant conduct. The degradation of a knight involved the hacking off of his spurs; and the serving before a knight of a pair of spurs on a dish, was a strong hint by his host that he had outstayed his welcome.

SPURGE (*Euphorbia*), a genus of plants of the natural order *Euphorbiaceæ*, having monœcious naked flowers, the male flowers membranous, and surrounding a tricoccous stalked female flower, the whole placed within a cup-shaped involucre. The fruit has three valves and three cells, the cells one-seeded, and bursting elastically. The species are very numerous, natives of warm and temperate climates, mostly herbaceous, but some of them woody. About twelve species are natives of Britain. All contain a resinous milky juice, which in most is very acrid. One of the most common British species is *E. helioscopia*, an annual plant, which has a simple stem of 4—8 inches in height, crowned by an umbel of five principal branches. The milky juice is used to destroy warts. Of the other British species, *E. peplus* and *E. exigua*, both small annuals, are among the most common, the former being generally found in gardens, the latter in fields and waste grounds. A much rarer plant in Britain is the Cypress Spurge, *E. Cyparissias*, a species with linear-lanceolate leaves, common in Germany, sometimes used as a purgative, but dangerous from its very poisonous qualities. *E. Gerardiana*, a species somewhat similar, found in many parts of Europe, is deemed a safer medicine. The CAPER SPURGE (*E. Lathyris*), a very rare plant in Britain, and probably not a true native, but common in thickets in the south of Europe, is remarkable for its violently acrid and at the same time narcotic qualities, which are especially resident in the bark of the root and the oil of the

seeds. This oil is used instead of Croton oil.—*E. officinarum* and *E. antiquorum* bear the name of EUPHORBIUM (q. v.), and yield the excessively acrid resin so called. *E. Ipecacuanha*, a North American species, growing in sandy places, yields a substitute for Ipecacuanha, but of quality less mild and less safe.

SPURGE LAUREL. See DAPHNE.

SPURN HEAD, the name given to the extreme point of a long, low, narrow, and shingly peninsula in the south-east of Yorkshire, at the mouth of the Humber, 24 miles south-east of Hull. Two light-houses have been built here, one of which is in lat. 53° 34′ 7″ N., and long. 0° 7′ 2″ E.

SPU′RREY (*Spergula*), a genus of plants which has been variously ranked by botanists in the natural orders *Caryophylleæ*, *Illecebraceæ*, and *Crassulaceæ*. The species are annuals, dichotomously branched, or with whorled branches; their leaves linear-filiform, in clustered whorls, with membranaceous stipules; the flowers in terminal divaricating corymbs. The flowers have a calyx of five sepals, five white petals, five or ten stamens, and five styles; the capsule is five-valved, with numerous round seeds, which are surrounded with a membranous wing or border. COMMON S., or YARR (*S. arvensis*), is plentiful in corn-fields, especially on light stony or sandy soils in Britain and most parts of Europe. It has weak spreading stems, sometimes two feet long in good soil, and is covered with clammy hairs. Its seeds are covered with yellowish-brown papillæ. It is commonly regarded in Britain as a mere weed; but in some parts of Europe, as Holland, Brabant, and the sandy districts of Germany, a larger variety with seeds destitute of papillæ is frequently sown for fodder. It is of very rapid growth, and is said to be as productive as an ordinary crop of clover. It is much relished by cattle. The seeds yield a bland oil, and the cake is equal in value to rape-cake.

SPURZHEIM, JOHANN GASPAR, a German physician and phrenologist, was born near Treves, December 31, 1776. While studying medicine at Vienna, he was introduced to Dr F. J. Gall (q. v.), whose pupil, and afterwards colleague, he became, in investigating the structure and functions of the brain (see PHRENOLOGY), in lecturing on the subject, and in writing for the press. In 1807 they settled in Paris, but parted in 1813; and next year S. came to England, where he published *The Physiognomical System of Drs Gall and S.* (Lond. 1815), *Outlines* of the same (1815), and a treatise on *Insanity* (1817). The first of these works having been severely handled by Dr John Gordon in No. 49 of the *Edinburgh Review*, S. proceeded to Edinburgh, and, in the lecture-room of his critic, demonstrated the reality of the anatomical discoveries which had been denied and ridiculed. To the same and other opponents, he replied in *An Examination of the Objections made in Britain against the Doctrines of Gall and S.* (Edinburgh, 1817). It was about this time, and under his tuition, that George Combe (q. v.) became a student of phrenology. After lecturing in many British and Irish cities, S. returned, in 1817, to Paris; but from 1825 till his death, he resided much in England, teaching and defending his opinions in lectures and books. In 1832, he went to America for the same purpose, and began his labours at Boston, but was cut off by fever on 10th November in that year. Besides the English works already mentioned, he wrote: *Elementary Principles of Education* (Edinburgh, 1821; 2d ed., Lond. 1828; French translation, Paris, 1822); *Phrenology* (Lond. 1825); *Philosophical Principles of Phrenology* (1825); *Phrenology in Connection with the Study of Physiognomy* (1826); *Anatomy of the Brain* (1826), supplemented, in 1829, by an Appendix, with *Remarks on Charles Bell's Animadversions on Phrenology; Outlines of Phrenology* (1827); and *Sketch of the Natural Laws of Man* (1828). Some of these were reprinted at Boston, U. S. His French works (besides those written jointly with Gall) are: *Obs. sur la Folie* (Paris, 1818); *Obs. sur la Phrénologie* (1818); *Essai Philosophique sur la Nature Morale et Intellectuelle de l'Homme* (1820); and *Manuel de Phrénologie* (1832). See *Phren. Jour.*, vol. viii. p. 126; *For. Quart. Rev.*, vol. ii. p. 15; *Memoir of S.*, by A. Carmichael (Dublin, 1833); and Combe's *System of Phrenology.*

SPY, in War, is a useful but not highly honoured auxiliary, employed to ascertain the state of an enemy's affairs, and of his intended operations. Spies have been used in all wars from the time when Moses sent Joshua on such a purpose to the present time. Their employment is quite recognised by the law of nations as interpreted by Grotius, Vattel, and Martens; nor is it held to be any dishonour to a general to avail himself of their services. On the other hand, the spy himself is looked upon as an outlaw, and one devoid of honour. If taken by the enemy, he is put to death ignominiously and without mercy. As, however, the calling is so dangerous, and so little redounds to honour, it is never permissible for a general to compel by threats any person, whether of his own or the hostile party, to act as spy; but he is at liberty to accept all such services when proffered. A spy is well paid, lest he betray his employer. In the British army, spies are usually controlled by the quartermaster-general. Martial law, though distinct enough in ordering the death of a spy, is not clear in defining what constitutes a spy. A man—not of the enemy—within the enemy's lines, and in the enemy's uniform, would presumably be a spy. If in civil dress, and unable to give a good account of himself, his chance of hanging would be considerable; but if found in one camp in the uniform of the opposite side, he may not be treated otherwise than as a prisoner of war, or at least as a deserter from the enemy.

Both as regards honour and penalties, it would seem that spies ought in fairness to be divided into two classes—first, those who betray their own country to an enemy; secondly, those who, being enemies, contrive surreptitiously to obtain information by penetrating into the opposing army. The first class are traitors of a deep dye, for whom no ignominious death is too bad; but the second class are often brave men, who dare much in the service of their country. It is unfair to accord them the same treatment as the traitors.

SQUA′DRON (Ital. *squadra*, from Lat. *quadra*, a square), in military language, denotes two troops of cavalry. It is the unit by which the force of cavalry with an army is always computed. Three or four squadrons constitute a regiment. The actual strength of a squadron ranges from 120 to 200 sabres.

In naval affairs, a squadron is a section of a fleet, under command of a junior flag-officer or commodore.

SQUA′LODON, Grat. A genus typical of a peculiar family of extinct cetaceans of the miocene period. Their structure is intermediate between that of *Basilosaurus* (Zeuglodon) and more typical whales. The front teeth are subcylindric, the posterior flat, two-rooted, and serrate, the brain-case not quite so contracted as in typical whales. There are several N. American species (*S. atlanticus*, etc.), and others are European.

SQUA′LUS AND SQUA′LIDÆ. See SHARK.

SQUAMIPENNES. See CHÆTODONTIDÆ.

SQUARE, in Military Evolutions, is the forming of a body of men into a rectangular figure, with several ranks or rows of men facing on each side. With men of ordinary firmness, a square should resist the charges of the heaviest horse. The formation is not new, for a Grecian syntagma was a solid square of 16 men in every direction; but in modern warfare, the solid square having been found cumbrous, has been abandoned for the hollow square, with officers, horses, colours, &c. in the centre. The front rank kneels, and the two next stoop, which enables five ranks of men to maintain a rolling fire upon an advancing enemy, or to pour in a murderous volley at close quarters.

SQUARE, in Geometry. See PARALLELOGRAM.

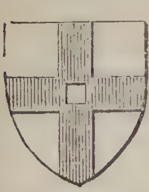
SQUARE AND SQUARE ROOT are particular cases of *Involution and Evolution* (q. v.), in which the second power and root are alone involved. The process by which the square root of a number is obtained resembles division, differing only by the circumstance, that the divisor is changed at each successive step. The rule adopted in arithmetic is deduced from algebra in the following manner: The square of $a + b$ is $a^2 + 2ab + b^2$, which may be written $a^2 + b(2a + b)$; and to find the square root of the latter, we have merely to subtract a portion (a^2), taking care that it be a square number, and forming a divisor with twice the square root of this portion ($2a$) increased by (b) the remainder of the root (which, in arithmetic, must be found by trial, as in division), and putting (b) the remainder of the root now found, in the quotient, proceed as in division. This mode of obtaining a divisor from the part of the root already obtained (a), and the part next to be obtained (b), and employing it, must be repeated till the whole square root is found. In the extraction of the square root in arithmetic, it is assumed that the squares of the nine digits are known; and also that the square of a number contains either twice, or one less than twice, as many digits as the number itself contains; the former being the case when the square number has an *even* number of digits, the latter when the number of digits is *odd*. By dividing, then, a number into periods of two figures each, we can at once see how many digits its root contains. To illustrate the method of operation adopted in arithmetic and algebra, let the square root of 128,881 be required; remembering that the square of $a + b + c$ is $a^2 + 2ab + b^2 + 2(a + b)c + c^2$:

	12,88 81(300 + 50 (or 350) + 9 = 359	
$(a^2 =)\ 300^2 =$	90000	$a + b$ (or $a + b) + c$
	38881	
$(2ab + b^2 =)\ 2 \times 300 \times 50 + 50^2 =$	32500	
$(2(a + b)c + c^2)$	6381	
$2 \times 350 \times 9 + 9^2 =$	6381	

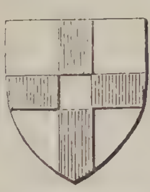
$a = 300$	12 88 81(300	$= a$
300	90000	$50 = b$
$2a + b = 650$	)38881	$9 = c$
50	32500	359
$2(a + b) + c = 709$	)6381	
	6381	

In the common arithmetical mode, the zeros are omitted, and we subtract from 12 the square nearest to it, not recognising the portion of the root, 3, as more than a digit of units, till the next period, 88, has been brought down for the second step, when it is evident that the 3 is *at least* 3 tens, and consequently the 6 in the divisor represents 60; similarly, it is only at the commencement of the third step that we find the 5 to represent 50, and the 3, 300. A comparison of the above examples will shew the agreement and difference between the two modes.

SQUARE-PIERCED, in Heraldry, a term used to designate a charge perforated with a square opening, so as to shew the field. A cross square-pierced is often improperly confounded with a cross quarter-pierced, where the intersecting part of the cross is not merely perforated, but entirely removed.



Square-pierced.



Quarter-pierced.

SQUARES, METHOD OF LEAST, in Astronomy, the best mode hitherto discovered of obtaining the most correct result from a number of observations upon any phenomenon. These observations are assumed to differ slightly from each other, and to be all of equal value, that is, taken under equally favourable conditions, and with equal instruments. The ordinary and long-established mode of approximating to the truth in such cases, is by finding the arithmetic mean, and accepting it as the correct result; but in all cases where the result required does not come directly from observation, but requires to be discovered by calculation, this simple and useful method is inapplicable, and that of 'Least Squares,' which gives more probable corrections, is adopted. The method is founded on a theorem which was first propounded by Legendre in 1806, more for the sake of insuring uniformity among calculators than from any belief in its intrinsic value; but it was afterwards thoroughly discussed and proved by Gauss and Laplace, that 'if the mean of a number of distinct observations be so taken, that the sum of the squares of its differences from the actual observations (generally designated *errors*) shall be a minimum, this mean will be, under these circumstances, the correctest obtainable value.' The process by which the mean thus obtained is shewn to be the most trustworthy approximation is too long for insertion here; but it may not be undesirable to give an example of the most common form of the method as occurring in astronomy. Let there be a series of equations—

$$\begin{aligned} X &= x + y + 2z, \\ X_1 &= 3x + 2y + 5z, \\ X_2 &= 4x + y + 4z, \\ X_3 &= -x + 3y + 3z; \end{aligned}$$

where the unknown quantities are x, y, and z, connected by various (the more the better) equations with X, X_1, &c., quantities which must be determined by actual observation. Suppose the values of the quantities thus found to be 3, 5, 21, and 14, then, since by hypothesis all these four observations are erroneous, the errors are $3 - X$. $5 - X_1$, $21 - X_2$, $14 - X_3$, or

$$\begin{aligned} 3 &- x - y - 2z, \\ 5 &- 3x - 2y - 5z, \\ 21 &- 4x - y - 4z, \\ 14 &+ x - 3y - 3z. \end{aligned}$$

The squares of these four errors are now added together; and, to find the values of x, y, and z, which will render this sum (call it S) a minimum, we must differentiate S with respect to x, y and z in turn, and putting each of these partial differential coefficients equal to zero, we obtain the three equations

$- 88 + 27x + 8y + 30z = 0$; $- 76 + 8x + 15y + 25z = 0$, and $- 157 + 30x + 25y + 54z = 0$; from which the most trustworthy values of x, y, and z can be found by common algebra.—For a full review of the whole of this subject, see a paper by Mr Ellis in the *Cambridge Transactions*, vol. viii.

SQUASH. See GOURD.

SQUIER, EPHRAIM GEORGE, American author and archæologist, was born at Bethlehem, New York, June 17, 1821. In his youth he was a school-teacher and engineer, and in 1840 was editor of *The Mechanic*, at Albany; in 1843, of the Hartford *Journal;* and in 1844, of the *Scioto Gazette*, in Ohio. His attention being attracted to the antiquities of the Scioto Valley, he made an exploration of similar monuments through the Mississippi Valley, an account of which was published in 1848, forming the first volume of the *Smithsonian Contributions to Knowledge.* He made similar explorations in New York, and on being appointed *chargé d'affaires* to Guatemala and the other states of Central America, he used his position as a means of making geographical and archæological explorations in those interesting regions. In 1851, he was honored with the medal of the French Geographical Society and Society of Arts, and made a member of other learned societies. In 1853, he surveyed a railway route through Honduras, and drew up the treaty between that country and England for the retrocession of the Bay Islands. Among his works are—*Nicaragua: its People, Scenery, Ancient Monuments, and Proposed Inter-oceanic Canal* (2 vols. 8vo, New York and London, 1862); *The Serpent Symbol, or Worship of the Reciprocal Principles of Nature in America* (1852); *Notes on Central America* (1854); *Waikna, or Adventures on the Mosquito Shore* (1855); *Question Anglo-Américaine* (1856); *The States of Central America* (1857); *Tropical Fibres* (1861); *Honduras; Descriptive, Historical, and Statistical* (London, 1870); articles in the *Encyclopædia Britannica*, &c. He was in 1864 appointed U. S. Commissioner to Peru, where he spent two years in examining the remains of the Incas, about whom he has written much, which is embodied in his book, *Peru; Incidents of Travel and Explorations* (New York, 1875).

SQUILL (*Scilla*), a genus of bulbous-rooted plants of the natural order *Liliaceæ*, nearly allied to Hyacinths, Onions, &c., and having a spreading perianth, stamens shorter than the perianth, smooth filaments, a 3-parted ovary, and a 3-cornered capsule with three many-seeded cells. Many of the species are plants of humble growth, with scapes like those of hyacinths, and beautiful flowers. Of these, two are natives of Britain: *S. verna*, which is common on the western and northern coasts, and particularly in Orkney and Shetland, and has fragrant flowers of a deep blue colour; and *S. autumnalis*, which grows chiefly on the coasts of the south of England, and has pinkish purple flowers. *S. bifolia* is a very doubtful native of Britain, but adorns hill-pastures and borders of woods in many parts of Europe with its blue flowers in early spring. *S. amœna* is another very beautiful species found in many parts of Europe. Few plants are better adapted than these for the adorning of flower-borders, or for house-culture.—Very different in habit from these is the OFFICINAL S. (*S. maritima*, or *Urginea Scilla*), a native of the sandy shores of the Mediterranean, which has a scape from two to four feet high, with a raceme of many whitish flowers, and large leaves. The bulb is of the size of a man's fist, or sometimes as large as a child's head, and contains a viscid juice so acrid as to blister the fingers if much handled, whilst the vapour arising from it irritates the nose and eyes. Squill was used in medicine by the ancients, and continues to be so still. The bulb is dug up in autumn, divided into four parts, the centre being cut out as being inert, and the remainder being cut into thin slices, which are quickly dried by a gentle heat. It is imported from Malta and other Mediterranean ports; also from St Petersburg and Copenhagen. The dried slices are white, or yellowish white, slightly translucent, scentless, disagreeably bitter, brittle, and easily pulverisable if very dry. The chemical composition of squill is not accurately known, its most active principle being a very acrid, poisonous, resinoid substance, soluble in alcohol, but not in ether. Whatever its active ingredients may be, they are taken up by alcohol, vinegar, and the dilute acids. This medicine is prescribed as a diuretic and expectorant, and occasionally as an emetic; but it must be recollected that in moderately large doses it acts as a narcotico-irritant poison, 24 grains having proved fatal. When given as a diuretic, it is usually prescribed in combination with digitalis and calomel, when it seldom fails to produce an increased secretion of urine, while at the same time it promotes the absorption of the effused fluid in the dropsy, which is generally present when diuretics are ordered. Its use is counter-indicated if inflammatory symptoms are present. Its dose as a diuretic is from one to three grains of the powdered bulb, or about twenty minims of the tincture. As an expectorant, it is much employed in the subacute stages and chronic forms of pulmonary affections, and is very serviceable in bronchitis and pneumonia of children. From its property of promoting the secretion of mucus, it gives relief by facilitating the expectoration in cases of asthma, &c., in which the sputa are viscid. In these cases, it is usually associated with some of the more stimulating expectorants, as senega or sesquicarbonate of ammonia. As an expectorant, the dose of the powdered squill should not exceed one grain, repeated several times daily. For children, the syrup, in doses of from ten to thirty minims, may be given. As its action as an emetic is uncertain, it should not be prescribed with the view of inducing vomiting, if other and more certain remedies are at hand.

Squill.

SQUI'LLA, a genus of Crustaceans, of the order *Stomapoda*, the type of a family, *Squillidæ*, to which the names *Mantis Crab*, *Mantis Shrimp*, and *Sea-mantis*, are popularly given, from the strong general resemblance to the insects of the genus *Mantis* (q. v.). The form is elongated; the carapace only covers the anterior part of the thorax, the latter part of which is formed of rings like the abdomen; the eyes are carried on stalks; the claws are very large, and furnished with spines, forming powerful instruments of prehension; the tail is

expanded into a broad fin. The species are numerous, and mostly inhabit tropical seas. A species about seven inches long, *S. mantis*, is found in the Mediterranean. The *Squillæ* are extremely active, and very bold and voracious.

SQUINCH, small arches or corbelled courses across the angles of square towers, to bring in the form to carry an octagonal spire, lantern, &c. See PENDENTIVE.

SQUI'NTING, or **STRABI'SMUS**, is a well-known and common deformity, which may be defined as a want of parallelism in the visual axes, when the patient endeavours to direct both eyes to an object at the same time. The squint is said to be *convergent* when the eye or eyes are directed towards the nose, and *divergent* when they are directed towards the temple, and is termed *single* or *double* according as only one eye or both are displaced. The divergent form is comparatively rare, except in consequence of a prolonged loss of sight of one eye. The causes of this affection are various. Intestinal irritation, such as the presence of worms, will often induce it slightly in children. In other cases, it may be traced to the temporary cerebral irritation produced by teething; and it is a very common symptom in hydrocephalus and other serious head-affections. Amongst other causes are a want of equal normal visual power in both eyes, in extreme short-sight; but from extensive observation with the ophthalmoscope, Mr Dixon, surgeon to the Royal Ophthalmic Hospital, Moorfields, has come to the conclusion, that 'in the great majority of instances of confirmed squint existing in children, the optic nerves themselves are ill-developed, being usually smaller than natural, of a more or less oval form, and of a dusky colour.'—Holmes's *System of Surgery*, vol. ii. p. 890. If the squint is only temporary, and possibly arises from intestinal irritation, the bowels must be well cleared out, and tonics subsequently given. If it is due to some peculiarity in the visual focus of the eyes, it may be removed by the judicious use of glasses. 'In every case,' says Mr Dixon, 'a careful ophthalmoscopic examination is the first duty of the surgeon; and he should also take every possible care to ascertain that no organic disease exists in the brain or orbital nerves; and that there is no tumour in the orbit, mechanically burdening the movements of the eye.' The surgical operation for the cure of squint consists in the division of the muscle which, by permanently drawing the eye inwards or outwards, and overpowering its antagonistic muscle, induces the deformity. It is better to dispense with the use of chloroform in this operation, if the patient have sufficient nerve to bear the operation without flinching, as in that case the doubt that sometimes arises as to whether the muscle has been sufficiently divided can be at once solved by directing the patient to attempt inversion of the eye; but in the great majority of cases, chloroform is found necessary.

SQUINTS, narrow apertures cut in the walls of churches (generally about two feet wide), to enable persons standing in the aisles to see the high altars. These openings are always in the direction of an altar.

SQUIRE, an abbreviated term for Esquire (q. v.). The same word is also popularly applied in England to country gentlemen; and in the United States of America to magistrates and lawyers, and sometimes to judges and justices of the peace.

SQUIRREL (*Sciurus*), a Linnæan genus of rodent quadrupeds, now the family *Sciuridæ*. They belong to the section of *Rodentia* having perfect clavicles, and are further characterised by a long bushy tail; the fore-paws furnished with four toes, which have curved claws, and a tubercular thumb; the hind-legs long, their feet with five toes; two incisors in each jaw; four molar teeth on each side in each jaw, simple, with tuberculous crowns, and a fifth in the front of the upper jaw, which soon falls out. Most of the species commonly carry the tail curved over the body, whence the Greek name *Skiouros* (*skia*, a shade, and *oura*, a tail), of which the English *squirrel* is a corruption. The species are numerous, and are found in almost all parts of the world, except Australia; some inhabiting temperate and even cold regions, whilst some belong to tropical countries. Squirrels are very active and lively creatures, at once shy and pert, very adroit in hiding themselves on the appearance of danger, but resembling monkeys in their inquisitive curiosity. They inhabit woods, and mostly spend their lives in trees, which they climb with wonderful agility, running along the branches, and leaping from tree to tree. Their running is a kind of bounding, and the tail is then stretched out, as it is also in their leaps from branch to branch, which are often to great distances. The Flying Squirrels are already noticed. Even the true squirrels resemble them in spreading out their limbs and tail to the utmost in leaping, particularly when they descend from a high branch to the ground, and they thus leap from a great height without injury. Some species, however, seldom ascend trees, but burrow in the ground, and are further distinguished by having cheek-pouches, whilst the tail is shorter than in the tree squirrels, and its hair not so distinctly arranged in two lateral rows. These *Ground Squirrels* form the genus *Tamias*. All the squirrels feed on fruits and seeds, the young shoots of trees, and other such vegetable substances; although they sometimes vary their diet by plundering birds' nests, and not only sucking eggs, but devouring young birds. They are also fond of the larvæ of insects. In eating, they often sit erect, and hold the food in their fore-paws. The hardest nut presents no difficulty to their sharp strong teeth. Many of the species, and probably all those of temperate and cold climates, lay up stores for winter.—The COMMON S. (*S. vulgaris*) of Europe is a beautiful little animal

Common Squirrel.

about eight inches and a half in length without the tail, which is fully six inches long, besides being apparently lengthened by its long hair. It is brownish red on the upper parts, and white beneath; the colour changes more or less in winter to a grayish brown, and in northern countries to gray, and even to white. The long hairs which fringe the ears, and are drawn up into a fine point, are longer in winter than in summer. The Common S. is

widely distributed over the northern parts of the Old World, and is plentiful in England, and in some of the southern parts of Scotland, into which, however, it is said to have been introduced. It is generally protected and its presence desired in the vicinity of mansions; although it often does considerable injury in plantations by gnawing off the top-shoots of trees, particularly of firs and pines. Morning is generally the time of the squirrel's greatest activity, except in winter, when it prefers the warmest hours. Although numbers are often seen together, they live mostly in pairs, which seem to continue attached throughout life. The S. makes a beautiful nest of moss, twigs, and dry leaves, curiously interwoven, most frequently in the fork of a tree at a considerable height from the ground. Here the young are produced, three, four, or five at a birth, in the middle of summer. They continue with their parents till the spring of next year. The winter hoards of the S., containing nuts, beech-mast, grain, and the like, are usually in holes in the ground about the roots of trees, not far from its ordinary abode, the same pair of squirrels having often a number of these hoards. The seeds of firs form a very considerable part of the winter-food of squirrels, and to obtain them, the scales are gnawed away from the cones. The S. is easily tamed, and is an amusing pet. It is almost in constant motion, except when asleep.—The only other European species is the ALPINE S. (*S. alpinus*), a native of the Alps and Pyrenees, about the same size with the Common S., deep brown, speckled with yellowish white.—North America abounds in species of squirrels. The GRAY S. (*S. migratorius*) occurs in the northern parts of the United States, and as far north as Hudson's Bay. It is much larger than the European S., the whole length with the tail being nearly two feet. It is usually light gray, with yellowish-brown head, and longitudinal stripes of yellowish brown, but it is often found almost entirely black. Its habits are very similar to those of the Common S., but it is more gregarious. Gray squirrels sometimes visit corn-fields in large numbers, and make great devastation. In Pennsylvania, an old law gave a reward of threepence a head for every S. destroyed, and in the year 1749 no smaller a sum than £8000 was paid out of the treasury on this account, so that 640,000 squirrels must have been killed. Hosts of this species of S. sometimes leave their native woods, and migrate like the Lemming (q. v.) of Northern Europe, whether urged by scarcity of food or through some other unknown impulse. These migrations usually occur in autumn, and are regarded with great horror by farmers. The squirrels advance in a straight course; mountains are no impediment, and although they swim with difficulty, they cross large rivers and the narrow bays of lakes.—The CAROLINA GRAY S. (*S. Carolinensis*) is a rather smaller species, abundant in the south-eastern parts of the United States, where its flesh is highly esteemed. A number of other species are found in different parts of North America, and very beautiful species occur in tropical countries, some of which live mostly in palms.—Of Ground Squirrels, several species are natives of North America, of which the best known is the CHIPPING S., HACKEE, or CHIPMUCK (*Tamias Lysteri*), abundant in almost all the eastern part of the United States, and as far as 50° N. lat. Its length, with the tail, is fully ten inches; the general colour gray, longitudinally striped with black and yellowish white. It derives its name from its *chipping* or chattering cry, which is like that of a young chicken. It seldom ascends trees; and is not troublesome to the farmer, as it does not attack standing corn, but gleans the fields, and feeds on fallen nuts in the woods. It burrows near the roots of trees, and several squirrels generally inhabit one burrow, which is deep and winding, and in which stores are laid up for winter use. In carrying nuts or other food to its retreat, it makes use of its cheek-pouches, cramming and distending them to the utmost.—A very similar species (*T. striatus*) inhabits Siberia.

The fur of some of the American squirrels is an article of commerce. It is one of the cheapest kinds of fur.

SQUITCH. See COUCH GRASS.

S'RÂDDHA (from the Sanscrit *s'raddhâ*, faith, belief) is the name of the funeral ceremony of the Hindus, in which balls of food, and water, are offered to the deceased ancestors of the sacrificer, or to the *Pitr'is* or manes collectively. It is especially performed for a parent recently deceased, or for three paternal ancestors, and is supposed necessary to secure the ascent and residence of the souls of the deceased in a world appropriated to the manes. But this ceremony is observed also on occasions of rejoicing as well as of mourning; and hence various S'râddhas are enumerated—viz. 1. S'râddhas which are *constant*, or the daily offerings to the manes in general, and those offered on the eighth lunation of every month; 2. S'râddhas which are *occasional*, as those for a relative recently deceased, or those to be performed on various domestic occurrences, as the birth of a son, &c.; and 3. S'râddhas which are *voluntary*, performed for a special object, such as the hope of religious merit, &c. The proper seasons for the worship of the manes collectively are the dark fortnight or period of the moon's wane, the day of new moon, the summer and winter solstices, eclipses, &c. The presentation of the ball of food to the deceased, and to his progenitors in both lines, is the office of the nearest male relative, *and is the test and title of his claim to the inheritance.*—See for further detail, H. H. Wilson's *Glossary of Judicial and Revenue Terms* (Lond. 1855), under *S'râddha*.

S'RÂVAKA (from the Sanscrit *s'ru*, to hear) is the name of the disciples of Buddha, who, through the 'hearing' of his doctrine, and by practising the four great Buddhistic truths, attain to the qualification of an Arhat, or Buddhist saint. From among the number of the disciples of Buddha, 80 are called the *Mahâs'râvakas*, or the great S'râvakas. The S'râvakas are entitled to the predicate *Âyushmat*, or 'one possessed of (long) life.'

S'RUTI (from the Sanscrit *s'ru*, hear, hence, literally, the hearing, or that which is heard) is, in Sanscrit Literature, the technical term for all those works which are considered to have been revealed by a deity. It applies, therefore, properly speaking, only to the Mantra and Brâhmana portion of the Vedas; but at a later period, it is applied likewise, if not especially, to the Upánishads. See VEDA.

SS, COLLAR OF, a collar composed of a series of the letter S in gold, either linked together or set in close order, on a blue and white ribbon, with the ends connected by two buckles and a trefoil-shaped link, from which hangs a jewel. Such collars have been much worn in England by persons holding great offices in the state, as well as by the gentry of various ranks, from esquires upwards. They are of frequent occurrence on sculptured monuments; but the origin of the device has not been satisfactorily explained. Among the numerous conjectures which have been formed regarding its meaning, one is, that the letter S stands for 'souveraigne,' the favourite motto of Henry IV.; others have suggested 'seneschal;'

and M. Planché hints that it may, with equal probability, owe its origin to the swan of the De Bohuns, that badge being found in one of the earliest examples of this collar (1402), pendent round the neck of the poet Gower, in St Saviour's Church, Southwark. The collar had, without doubt, originally a Lancastrian character. Collars of SS are still worn, with certain recognised distinctions, by the Lords Chief Justices, the Lord Chief Baron of the Exchequer, the Lord Mayor of London, the Heralds and the Serjeants-at-Arms.

STA'BAT MA'TER, a celebrated Latin hymn on the Crucifixion, beginning

> Stabat mater dolorosa
> Juxta crucem lacrimosa
> Dum pendebat filius.

The *Stabat Mater* forms part of the service of the Roman Catholic Church during Passion-week. Its authorship has been assigned to Jacopone, a Franciscan, who flourished in the 13th century. It has been set to music by many composers of eminence. Pergolese's *Stabat Mater*, written by that eminent musician on his deathbed, is justly celebrated for its pathos and expression. Rossini's more secular *Stabat Mater* is also well known to all lovers of music.

STABI'LITY AND INSTABI'LITY. When a body rests upon a surface, in such a manner that a vertical from its centre of gravity falls within the largest polygon which can be formed by joining the various points of contact of base and surface, it will stand; but if the contrary is the case, it will fall, unless extraneously supported. If the base of the body be a plane, and the supporting surface convex, or *vice versâ*, or if both base and surface be convex, there will be only one point of support, and if the body be at rest, its centre of gravity must be vertically over the point of contact. Should a body so placed receive a slight impulse, it will either oscillate to and fro, ultimately returning to its original position, or remove further and further from its original position, shewing a tendency not to return, or appear indifferent to any one position. In the first case, the body is said to be in *stable*, in the second case, in *unstable*, and in the third, in *neutral* equilibrium. Fig. 1

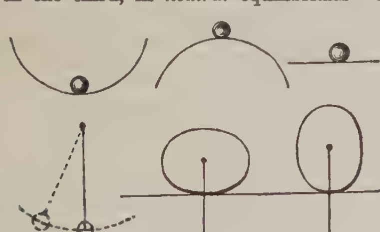


Fig. 1.

shews various illustrations of these three species. It will appear at once that the predetermining cause of equilibrium being of one rather than of another of these species, is the tendency of the centre of gravity of every body to seek a lower position; and the illustrations shew that in stable equilibrium the centre of gravity of the body may, and in unstable equilibrium may not, attain a lower position, while in neutral equilibrium its position continues unaltered. In illustration of the mode in which the species of equilibrium possessed by a body which has received a slight impulse is determined, let us take the case of a body with a spherical base resting upon a spherical surface (fig. 2); let S and O be the centres of the spherical surfaces respectively, and let A be their point of contact (the centre of gravity being consequently in the line SA, or in it produced towards S, and after displacement, in the line S′A′, produced if necessary), let the new position of S, after the body

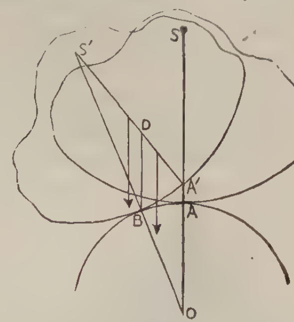
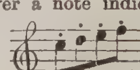
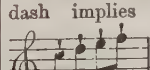
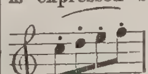


Fig. 2.

has been slightly displaced, be S′, and the new point of contact B; join OS, OS′, S′A′, and draw BD vertically, that is, parallel to OC. Then $A'D : A'S' :: OB : OS'$, or $A'D = \frac{A'S' \times OB}{OS'}$, that is, $A'D$ = the product of the radii of the two surfaces divided by their sum. Now, should the centre of gravity of the displaced body fall between D and A′, it will have a moment round B tending to restore the body to its former position (*stable equilibrium*); should the centre of gravity be beyond D from A′, its moment round B will tend to increase the displacement (*unstable equilibrium*); while, if it fall in the line BD, it will still be above the point of contact, as it was at first, and there will be no tendency either to return to, or to move further from, the original position (*neutral equilibrium*). These conditions may be briefly expressed by the following formulæ, in which R is the radius of the supporting surface, r of the spherical base of the body, and X the distance of the centre of gravity from the point A; when equilibrium is stable, X is less than $\frac{R \times r}{R + r}$; when unstable, X is greater than $\frac{R \times r}{R + r}$; and when neutral, $X = \frac{R \times r}{R + r}$. From these formulæ, the conditions of equilibrium of a body, with a spherical base on a plane surface, can be at once deduced by making $R = \infty$, the three species of equilibrium being then represented in order by X less than r, X greater than r, and $X = r$; the simplest illustrations of these being respectively a segment of a sphere, a tall cone on a spherical base, and a sphere.

STACCA'TO (Ital. detached), in Music, a term implying a detached, abrupt mode of performance. A certain amount of time is subtracted from the proper value of any note played staccato, and a rest substituted. A dot placed over a note indicates that it is to be played staccato: . A dash implies a greater degree of staccato: , and a very slight degree of staccato is expressed by uniting the dot with the slur: ; the slur being the sign of a *legato* expression, the converse of staccato.

STA'CHYS, a genus of plants of the natural order *Labiatæ*, containing a great number of species, mostly European, having a ten-ribbed calyx, with five nearly equal teeth, the upper lip of the corolla entire, and the lower lip three-lobed. Several species are natives of Britain. *S. sylvatica* is very common in shady places, a coarse herbaceous plant, sometimes called *Hedge Nettle*, with stem 2—3 feet high, ovate heart-shaped leaves on long stalks, whorls of purple flowers, and unpleasant smell. *S. palustris* is another very common British species, growing in moist places, and sometimes proving a

Betony (*Stachys officinalis*).

very troublesome weed in meadows. The plant was formerly used as a vulnerary, and has therefore the English name *Woundwort.* Several species are not unfrequently to be seen in flower-gardens. To this genus some botanists refer the COMMON BETONY or WOOD BETONY (*S. betonica*, or *Betonica officinalis*), plentiful in woods and thickets in the southern parts of Britain, a plant one or two feet high, with hairy stem, oblong heart-shaped leaves, whorls of purple or white flowers, and a fetid smell. It was formerly much used in medicine. The roots, in small doses, are emetic and aperient.

STADE, a small but very ancient fortified town of Prussia, province of Hanover, about a mile from the mouth of the Schwinge in the Elbe. Pop. 8544.

The *Stade Dues* were a toll or duty which was formerly charged by the Hanoverian government on all merchandise carried up the Elbe to Hamburg. The original duties, as regulated by a treaty of date 1691, were comparatively light, but they had been gradually increased till they brought to Hanover a revenue of £40,000. After several modifications in 1844 and 1854, this vexatious toll was finally abolished in 1861, Hanover receiving a compensation equivalent to £30,000 annually, of which Great Britain paid one-third, another third was contributed by Hamburg, and the remaining third divided proportionally among the other countries that traded to the Elbe.

STA'DIUM, the course set apart for foot-races and all the other games excepting horse-racing, which were wont to be celebrated at Olympia and other places in Greece; the horse and chariot races being held in the *Hippodrome* (q. v.). The stadium was of the same form as the hippodrome, and the arrangement of the spectators was similar. The distance between the starting-point and the goal was, in the Olympic stadium, about 600 Greek feet, and the stadia of other places adopted the dimensions of that at Olympia. This distance of 600 Greek feet was adopted as the chief Greek measure of length, and called a *stadium.* It was equivalent to 625 Roman feet, or 125 Roman paces; hence the Roman mile of 1000 paces contained exactly 8 stadia.

STA'DTHOLDER (Ger. *stadthalter*, Dutch *stadhouder*, lieutenant or governor of a province). In the German cantons of Switzerland, the name is given to the second civil officer, who ranks next to the landamman. In the republic of the Seven United Provinces, the chief magistrate or president of the union was called the stadhouder. In the 16th c., when the tyranny of Ferdinand, Duke of Alva, governor under Philip II., drove the principal towns into revolt, they chose William, Prince of Orange, for their governor, and with the view of letting it be understood that the revolt was not against Philip, but against Alva, they conferred on William no higher title than that of Stadhouder. On the assassination of William in 1584, the provinces of Holland, Zeeland, and Utrecht agreeing to have one stadhouder, appointed Maurice of Nassau to that office, which came tacitly to be looked on as hereditary. The stadhouderate thus instituted was considered to be at an end or in abeyance on the extinction of the line of William I., by the death of William III. However, on the triumph of the Orange party over the Republican in 1747, William IV., descended from a collateral branch of the House of Nassau, was proclaimed stadhouder, captain-general, and admiral-in-chief of the Seven United Provinces, those dignities being made hereditary in his family. His son, William V., the seventh stadhouder, was driven from his country by the French in 1795, and resigned his office in 1802; since which time, the stadhouderate has never been revived, the Netherlands having, at the Congress of Vienna, been formed into a kingdom.

STAËL-HOLSTEIN, ANNE LOUISE GERMAINE NECKER, BARONNE DE, was born at Paris, April 22, 1766. Her father was the celebrated M. Necker (q. v.), finance minister of Louis XVI., in the times immediately preceding the Revolution. Her mother was a woman of severe character, and from her earliest years subjected her to a discipline almost puritanic in its rigour. The daughter, in consequence, had no very warm attachment for her; but for M. Necker, who softened as he could by his indulgent tenderness the harsh rule of his spouse, she entertained the most ardent affection, regarding him then and always with what was almost an idolatry of fondness and admiration. Her talents were precociously developed, and whilst yet the merest girl, she would listen with eager and intelligent interest to the conversation of the Parisian *savans* who used to frequent the house of her father. In 1786, she was married to the Baron de Staël-Holstein, Swedish minister at Paris, an elderly gentleman, with whom her happiness was probably not great, inasmuch as, a few years after, a separation between them took place, two sons and a daughter having been meantime the fruit of their union. In 1788, she issued her first work, *Lettres sur les Ecrits et le Caractère de J. J. Rousseau*, which are rather a passionate eulogy of a girlish idol than a just and discriminating criticism.

Her sympathy with the Revolution in its earlier stage of promise was profound, but gave place, as its later enormities were developed, to a reaction of horror, which is vividly set forth in her subsequent *Considérations sur la Révolution Française.* Her grief was extreme on the failure of the attempt to

escape on the part of the royal family, and she engaged in a secret scheme for securing them a flight to England. This, however, came to nothing; and she then, along with her father, betook herself to Switzerland, his native country. The news of the king's execution inexpressibly shocked her; and she sought to save the life of the queen by publishing *Réflexions sur le Procès de la Reine, par Une Femme*, which, however, was too late to be effective. In 1795, she published at Lausanne, under the title *Recueil de Morceaux Détachés*, a collection of her juvenile writings; and the year after, a treatise *De l'Influence des Passions sur le Bonheur des Individus et des Nations*, a work full of originality and genius. In 1797, order having been re-established under the Directory, she was once more in Paris. From the first, she distrusted the designs of Napoleon, and her *salon* became the headquarters of the anti-Bonapartist faction. In vain she was offered restitution of two million livres since 1788 due to her father from the royal treasury; she scornfully declined the bribe; and as neither fear nor favour could lead her to disguise her hostility to him, it seemed well for Napoleon to rid himself of her. She was forbidden to live in Paris, and subsequently (1802) exiled from France itself. Meanwhile, she had greatly increased her reputation by the publication of her romance of *Delphine*, and a work *Sur la Littérature considérée dans ses Rapports avec l'Etat Moral et Politique des Nations*. She now, for two years, travelled in Italy and in Germany, making at Weimar the acquaintance of Goethe, Schiller, Herder, Wieland, &c. The death of her father in 1804 recalled her to Coppet, in Switzerland. Subsequently, she was permitted to return to Paris, and there, in 1807, she published her famous *Corinne, ou l'Italie*, the success of which was instant and immense, and won for her a really European reputation. As a bitter in the sweet of fame, however, fresh difficulties with Napoleon occurred, and she was banished anew to Coppet. Her son, the Baron Auguste, then 17 years old, sought to intercede for his mother in a personal interview granted him by the emperor, whose inexorable deliverance on the occasion is too characteristic and amusing to be omitted: 'Avec l'exaltation de sa tête, la manie qu'elle a d'écrire *sur tout et à propos de rien*, elle pouvait se faire des prosélytes; j'ai dû y veiller.' And in candour it is to be admitted, despite of the shrieks which have ever since been put forth about Napoleon's so-called 'ungenerous persecution,' that he acted on the dictate of a sound prudential policy. A woman who would keep no terms with him, who was uncompromising and fearless, and an influence by the weight of her genius and reputation, was clearly in Paris, of all places, a phenomenon not to be tolerated by the head of a government such as his, more or less the sport of the hour, as always in its basis precarious. After this, when disgusted with Coppet, where she found herself subjected to a petty *surveillance*, Madame de S. rushed restlessly over Europe to Vienna, Moscow, St Petersburg, thence through Finland to Stockholm, and afterwards to London, where, in 1813, she published her great book, *De l'Allemagne*, which had previously been suppressed in Paris. As the first decisive revelation of the genius of Germany to the French people—somewhat as the earlier writings of Mr Carlyle revealed it to the reading public of Britain—this may perhaps rank as the most important and influential of her works. Of her various experiences of travel, an interesting record is preserved in her *Dix Années d'Exil*. At the Restoration, she returned to her beloved Paris; from Louis XVIII. she met with a most gracious reception; and restitution was granted her of the two millions on her father's account before mentioned. Soon after, her health failed; she sought its restoration in a visit to Italy in 1816, but without effect, and on July 14, 1817, she died at Paris. She was buried at Coppet; and by her will the fact was revealed that, in 1812, she had privately married M. de Rocca, a French officer of hussars, aged 25; which may be looked upon as something of an *escapade* for a mature matron of 46. In this wedlock, she gave birth to a son. M. de Rocca survived her only a few months. On the whole, she had scantly been happy, as cursed with the 'desires infinite and hopes impossible' which make life little better than a sad unfulfilled longing to many of her peculiar temperament and genius. Her touching wail of '*Jamais, jamais, je ne serai jamais aimé comme j'aime*' was a cry out of her inmost heart. In this light, there may perhaps seem some element of pathos in this marriage, which looks otherwise a little ridiculous.

Madame de S.—all just deduction from her claims being made—must be ranked in the first class of female genius. Without question of her real power and originality, in the combination she presents of such a force of intellect as women have but rarely exhibited, with depth and tenderness of sentiment seeking its natural outlet in a rich and impassioned rhetoric, she may curtly, yet with clearness sufficient, be defined as a sort of Rousseau in petticoats.

STAFF, in Music, the name given to the five parallel lines and four intermediate spaces on which the characters indicating musical sounds are placed, the various degrees of the staff indicating differences of pitch .

STAFF, in a Military sense, consists of a body of skilled officers, whose duty it is to combine and give vitality to the movements and mechanical action of the several regiments and drilled bodies composing the force. The distinction between an officer on the staff of an army and a regimental officer is that the latter is concerned with his own regiment alone, while the former deals with his army, or section of an army exceeding a regiment, and regulates the combined action of the several arms and bodies of men. A good staff is all-important to the success of a military enterprise.

The *General Staff* of an army comprises the general in actual command, with the subordinate generals commanding the several divisions and brigades: as assistants to these, the officers of the adjutant-general's department—i. e., the adjutant-general, his deputy, assistants, and deputy-assistants, if the army be large enough to require all. Similarly, the officers of the quartermaster-general's department; the brigade-major; the provost-marshal; and the judge-advocate; the functions of all of whom are described under their respective heads. The general staff of the British army consists at present of a field-marshal commanding-in-chief, whose head quarters are at London; under him, of a lieutenant general commanding-in-chief in Ireland. This command includes, of course, the general officer commanding in each military district of the United Kingdom and in each colony; each of these generals having the usual subordinate staff subject to his orders. India forms a nearly independent command, under a commander-in-chief, whose headquarters are in Bengal. There are subordinate commanders-in-chief in Bombay and Madras; and in each presidency there are several military divisions. A certain period of military service, and certain qualifications, are required in an officer before he can be appointed to the general staff, and the

preference is given to officers who have passed the Staff-College.

The *Personal Staff* consists of the aides-de-camp and military secretaries to the respective general officers. These officers, who are treated of separately, are appointed, within certain limits, by the generals whom they serve, and their appointments expire on those generals ceasing to command.

The *Garrison Staff* consists of the officers governing in fortresses and garrisons; as Commandants (q. v.), Fort-majors (q.v.), Town-majors (q. v.), Fort-adjutants (q. v.), and Garrison-adjutants.

The *Civil or Departmental Staff* includes those non-combatant officers who have to provide for the daily requirements of the troops. These are the commissariat, barrack, medical, chaplains, purveyors, store and veterinary departments. These departments are described under their several names.

The *Recruiting Staff* consists of inspecting field-officers, district paymasters, district adjutants, and superintending officers. See RECRUITING.

The *Pensioner Staff* includes only the staff-officers of the enrolled force. See PENSIONERS.

The *Volunteer Staff* has an inspector-general, with his deputy, and assistant-inspectors in the several volunteer districts. See VOLUNTEERS.

The *Regimental Staff* includes the colonel, lieutenant-colonel, major, adjutant, paymaster, quartermaster, inspector of musketry, and medical officers. See REGIMENT.

In the French and most of the continental armies, the staff is divided into the *état-majeur*, or general staff, and the *intendance*, under an *intendant-général*, which comprises all the civil departments. There is, of course, a regimental staff in addition. The want of this concentration of the civil departments has been often felt in the British service. See INTENDANT.

In the Navy, the staff of a fleet consists of the Flag-officers (q. v.), the Flag-lieutenants (q. v.), and Secretaries (q. v.); also of the inspector-general of hospitals (see MEDICAL DEPARTMENT, NAVY), and an inspector of machinery.

STA'FFA, a celebrated islet on the west of Scotland, lies about 7 miles off the west coast of Mull. It forms an uneven tableland, rising at its highest to 144 feet above the water, 1½ miles in circumference, and oval in shape. In the north-east, in the lee of the prevailing winds, is a tract of low shore, stretching out in beaches, and forming a landing-place. The other parts of the coast are girt with cliffs of from 84 to 112 feet high. Regarded in section, the rocks shew themselves to be of three kinds—conglomerated tufa forming the basement; columnar basalt, arranged in colonnades, which form the façades and the walls of the chief caves; and amorphous basalt, overlying the columnar basalt, but pierced here and there by the ends of columns and by angular blocks. The most remarkable feature of the island is Fingal's or the Great Cave, the entrance to which is formed by columnar ranges on each side, supporting a lofty arch. The entrance is 33 feet wide, and 60 feet high, and the length of the cave is 212 feet. The floor of this marvellous chamber is the sea, which throws up flashing and many-coloured lights against the pendent columns, whitened with calcareous stalagmite, which form the roof, and against the pillared walls of the cave.

STAFF COLLEGE is a British institution founded in 1858, about two miles from Sandhurst, to the Military College at which place it is affiliated, for the purpose of giving higher instruction to 30 officers aspiring to appointments on the staff. It thus took the place, though more effectively, of the old senior class at the Royal Military College. To be entitled to compete for entrance, an officer must have been three years in active service, must have passed the qualifying examination for a captaincy, and must have the recommendation of his commanding officer. A very serious examination decides which among the competitors shall be admitted to the college, one only being eligible from any battalion. While at college, the students receive their regimental pay, and the whole educational charges (annually £8670) are borne by the public. The course lasts two years. At the end of each year, there is an examination; that of the second fixing the order of the candidates' choice for staff employment. After passing the Staff College, the officer is attached for duty, for a short period, to each of the arms with which he may not have already served. He then becomes eligible for appointment to the staff as opportunity may occur.

STAFF CORPS. During the wars of Wellington, the generals and staff officers were aided by a staff corps composed of intelligent officers and men who performed camp duties, made reconnaissances, and executed other necessary labours for which regimental officers or soldiers were unsuited. This corps died out after the peace. At present, there are three staff corps—the Commissariat Staff Corps, Army Hospital Corps, and Military Store Staff Corps—which consist of artificers, labourers, and orderlies, to aid in the work of their respective departments—as butchers, wardmasters, armourers, copyists, &c. The annual cost of these three corps is about £65,000.

STA'FFORD, an inland county of England, bounded on the W. and N.-W. by Shropshire and Cheshire, has an area of 728,468 acres, and a pop of (1881) 981,385. The most elevated portion of the county is the north, where wild moorlands in long ridges, separated by deeply cut valleys, extend from north-west to south-east, and subside as they near the valley of the Trent. The surface is low or undulating in the midland regions, but becomes hilly again in the south. New red sandstone occupies the whole of the central parts; the Pottery coal-field occupies the north, and the Dudley coal-field, remarkable also for its abundant and rich iron ores, occupies the south. The Trent, flowing first south-west through the county, then north-east along its eastern border, is the chief river. The climate is cold and humid, and though three-fourths of the area are arable, much of the soil is cold and clayey, and agriculture is in a backward condition. The Potteries lie around Stoke (q. v), Burslem, and Hanley, and here most extensive manufactures of china and earthenware are carried on. See POTTERY and WEDGWOOD. In the south, iron is very largely manufactured in all its branches, from mining to the production of articles in iron and steel. The numerous canals (including the Grand Trunk Canal) and railways which intersect and traverse the county, afford abundant and most useful means of communication and conveyance. The county of S. returns six members to the House of Commons.

STAFFORD, the county town of Staffordshire, stands on the Sow, 25 miles north-north-west of Birmingham. The usual municipal institutions of county towns are the chief buildings, and there are two fine and partly ancient parochial churches Tanning, cutlery, and the manufacture of shoes are the chief branches of industry. S. sends two members to the House of Commons. Pop. (1881) 19,901.

STAG, a name familiarly given to a person who applies for an allocation of shares in a joint-stock concern with a view of selling the allocation letter to another party for a small consideration.

When no such consideration or premium is obtainable, the *stag* does not pay the deposit, which by his application he had become bound to do, and relinquishes any further interest in the undertaking. Persons acting thus, however, are liable to prosecution and exposure as defaulters. During the great railway mania of 1846, the stock-market was thronged with stags.

STAG, or RED DEER (*Cervus elephas*), a species of Deer (q. v.) with round antlers, which have a snag at the base in front. The female has no horns, and is called a *Hind*. The young male, during the first year, acquires mere knobs in place of horns. In the second year they are longer and pointed, when the animal is called a *Brocket*. The branching of the horns increases every year till the sixth, when the name Hart (q. v.) begins to be applied. After this, the age is no longer indicated by an increased number of branches, but the antlers become larger and thicker, their furrows deeper, and the *burr* at the base more projecting. The oldest stags have seldom more than ten or twelve branches, although an instance has occurred of 33 on each antler. A fine S. is four feet or more in height at the shoulder. The colour is reddish brown in summer, the rump pale; in winter, it is brownish gray. The female is smaller than the male. The young is at first spotted with white. The S. is a native of Europe and the north of Asia. It was anciently common in all parts of Britain, but is now almost extinct, except in the Highlands of Scotland, where large herds still exist, particularly on the Grampians, and the sport of deer-stalking is pursued, in which the rifle is now generally used; although, in former

Stag, Hind, and Calf (*Cervus elephas*).

times, the S. was hunted, hounds of a peculiar breed, called Staghounds (q. v.), being employed for the purpose. The forest laws of England were extremely strict for the preservation of this noble game, the unauthorised killing of a S. being even a more unpardonable offence than the killing of a man. The S. feeds on the buds and young shoots of trees, and on grass; or, in the severe weather of winter, on bark and mosses. The speed of the S. is very great. It has also great powers of swimming, and has been known to swim ten miles. When hard pressed by hunters, it turns to bay, and is not approached without danger. At the pairing season, which is in August, even tame stags become so excited that it is not safe to approach them. The domestication of the S. is never very complete. In fighting, the S. uses not only its horns, but its fore feet, with which it gives severe blows to an adversary. The flesh of the S. is not so good as that of the Fallow Deer.—Among the species of deer most nearly allied to the S. are the Wapiti (q. v.), an American species, and several species belonging to the warmer parts of Asia and the north of Africa. They all have round branched antlers, with a basal snag in front, and a tuft of hair on the hind legs above the middle of the metatarsus.

STAG BEETLE (*Lucanus*), a genus of coleopterous insects, of the family *Lamellicornes*, remarkable for the large projecting mandibles of the males

Stag Beetle (*Lucanus cervus*).

which have large denticulations, and somewhat resemble stags' horns. The antennæ terminate in a club composed of many leaflets, disposed on an axis like the teeth of a comb. The COMMON S. B. (*L. cervus*) is one of the largest of British insects, the males being fully two inches long. It flies about in the evening in the middle of summer chiefly frequenting oak-woods. The larva feeds on the wood of the oak and willow, and is injurious to the trunks of trees, into which it eats its way very rapidly. It is supposed to be the *Cossus* of the ancient Romans, much esteemed by them as a delicacy. It lives for several years before undergoing its transformations. In its perfect state, the S. B. is a formidable-looking insect, and its powerful mandibles are capable of inflicting a pretty severe bite, if it is incautiously seized, but it is not venomous. Some of the tropical stag beetles are remarkable for their brilliancy of colour.

STAGE. See THEATRE.

STA'GGERS is a popular term applied to several diseases of horses. Mad or Sleepy Staggers is inflammation of the brain, a rare but fatal complaint, marked by high fever, a staggering gait, violent convulsive struggling, usually terminating in stupor, and treated by bleeding, full doses of physic, and cold applied to the head. Grass or Stomach Staggers is acute indigestion, usually occasioned by overloading the stomach and bowels with tough hard grass, vetches, or clover, a full meal of wheat, or other indigestible food. It is most common in summer and autumn, is indicated by impaired appetite, distended abdomen, dull aspect, unsteady gait; and is remedied by full doses of purgative medicine, such as six drachms of aloes and a drachm of calomel rubbed down together, and given in a quart of thin well-boiled gruel. Frequent clysters, with hand-rubbing and hot water to the belly, are likewise useful. Where the dulness increases stimulants should be freely given.

STAGHOUND, a large and powerful kind of Hound (q. v.), formerly much used in England for hunting the stag, but now almost extinct. It is supposed to be a breed of the old English Southern

Hound. In scent, it is almost equal to the bloodhound; in fleetness, it is inferior to the foxhound. It has great power of endurance, and has been

Staghound.

known to run 50 miles after the stag. It is also courageous, and does not hesitate to attack the stag when at bay.

STAHL, Georg Ernst, a celebrated German physician and chemist, was born at Anspach, 21st October 1660, studied medicine at Jena, and after practising successfully for some time, was called, in 1694, to the chair of Medicine, Anatomy, and Chemistry, in the newly-founded university of Halle; whence he removed to Berlin in 1716, where he was appointed physician to the king of Prussia. He was a member of the Berlin Academy, and died in that city 14th May 1734. According to Blumenbach, S. is to be considered as one of the greatest and most profound physicians the world has ever seen, though the mysticism with which his works are imbued is to be reprehended. S.'s system of medicine, which was a combination of the physiology of Van Helmont (q. v.) with the psychology of Descartes, is founded upon the supposition of the existence of a mysterious force residing in, but independent of, and superior to matter; this force, the *anima* (or 'soul'), not only forms the body, but directs it in the exercise of all its functions, and this, too, sometimes unconsciously; though the way in which this influence is exercised he does not explain. Being subject to error by nature, the 'anima,' by negligence or maladroit action, originates diseases in the body, which it then attempts to cure, through the functional action of the various parts. S. held that art ought only to commence where nature had ended, and to be useful, it should follow a similar course of action; he was also of opinion that plethora, either local or general, was one of the chief causes of disease. His system of therapeutics corresponded with his pathological principles, and was confined mostly to bleeding and the use of mild laxatives. His psychological theory of the connection between the soul and body led him into a discussion with Leibnitz (who had falsely charged him with propounding materialism), from which he emerged victorious on the essential points of their respective theories; though Leibnitz had the advantage in matters of detail. Subsequent physiologists have made S.'s opinions the object of ridicule, though his doctrine of the 'anima' is, under the name of 'vital principle' and 'nature,' generally adopted at the present day; but his supercilious contempt for chemistry as a medical agent has long ceased to be generally upheld. Nevertheless, S. was one of the ablest chemists of his time, destroyed, in his usual trenchant style, numberless absurd opinions which had found their way into the science, and propounded the first theory of combustion (see Phlogiston), which was universally accepted till the time of Lavoisier (q. v.). His works, according to Haller, number 250, but the chief are—*Theoria Medica vera* (Halle, 1707, 1708, 1737), which contains his medical theory, and *Zymotechnia Fundamentalis, seu Fermentationis Theoria Generalis* (Halle, 1697), in which his chemical opinions are set forth. An account of his opinions is found in Haller's *Bibliotheca Medicinæ Practicæ*, vol. iii.; Sprengel's *Histoire de la Médecine;* A. Lemoine's *Le Vitalisme et l'Animisme de Stahl* (Paris, 1864), and numerous other works.

STAINED GLASS. See Glass.

STAINS FOR WOOD. A variety of stains have recently been invented for the purpose of giving to the cheaper kinds of wood, such as deal, &c., the appearance of the more costly kinds. These are chiefly solutions of certain metallic salts, combined with vegetable infusions.

STAI'RCASE. This feature, now so important in all houses, was of small note till about the time of Queen Elizabeth. Previously, stairs were all constructed on a circular plan, revolving round a central axis or newel, and were called turret or corkscrew stairs. During the 16th and 17th centuries, staircases with wide straight flights were first introduced, and were made leading features in the mansions of the Elizabethan style. They had usually massive oak balusters with carved pedestals, and were ornamented with carved panels, pendants, &c. Staircases of this description are still in common use, but are lighter in style, light cast-iron railings being substituted for the heavy oak balustrades.

STAKE NETS. See Salmon.

STALA'CTITES and STALAGMITES are found in caves and other places where water charged with carbonate of lime is subject to evaporation. Water impregnated with carbonic acid is able to dissolve lime, and as all rain and surface water contains more or less carbonic acid, it takes up in its passage through the earth to the roofs of caves a certain amount of lime. When the water is exposed on the roof or floor of the cave, evaporation takes place, and so both the bulk of the water and its solvent power are reduced, and a thin pellicle of solid carbonate of lime is deposited. When this takes place on the roof of the cave, long icicle-like pendants are formed, which are called stalactites; and when the water drops upon the floor, a stalagmitic layer is formed, which rises at the points where the largest supply of material exists, in the form of pillars to meet the overhanging stalactites. In some caves, the descending and ascending points have met, and formed a series of natural columns as if supporting the roof. The colour of the limestone thus formed is affected by the superincumbent strata, but it is generally white or yellowish. The stalactites have a rich subcrystalline structure, being composed of acicular radiating crystals, arranged in concentric layers from their exogenous growth. Sometimes, from metamorphic changes that have taken place subsequent to their formation, they become more truly crystalline. The amount of the deposition is very great in some caves, and the wonderful variety and singular groupings of the stalactites give them a peculiar beauty. The caves most remarkable in

this way are the Cave of Adelsberg in Styria, the Grotto of Antiparos in the Grecian Archipelago, Wyer's Cave in the United States, and the caves of the Peak in Derbyshire.

The remains of primeval man found in the caves in France, and the fossils from the bone caves in Britain and elsewhere, are generally cemented together into a stalagmitic deposit on the floor of the cave.

STALL, a fixed seat enclosed at back, and with elbows at the sides. One or more rows of these extended along each side of the choir of most churches before the Reformation, and fine examples still remain in nearly all the cathedrals. They are generally enclosed at back with a high screen, and covered with canopies ornamented with pinnacles, &c.

STA'LYBRIDGE, a market-town and municipal borough, partly in Lancashire and partly in Cheshire, stands on the Tame, eight miles east of Manchester. It is remarkable chiefly for its cotton manufactures, which are very extensive. The print-works, iron-foundries, and machine-shops are also numerous and important. Free communication by railway is afforded in every direction. There are in S. 39 mills employing 10,000 hands, and 28 foundries and machine shops employing 1100 hands. Pop. (1881) of municipal borough, 22,784.

STAMBOU'L. See CONSTANTINOPLE.

STA'MENS are those parts in the flowers of phanerogamous plants which excite the pistil to the formation of the fruit, and thus effect fertilisation or Fecundation (q. v.). A stamen consists of a receptacle—the *anther;* which contains a dust—the *pollen*—various in colour, but generally yellow, and is generally supported on a stalk called the *filament;* the anther being the blade of a metamorphosed leaf, and the filament the leaf-stalk. The filament is, however, sometimes awanting, and the anther is then said to be *sessile.* Each anther generally consists of two cells, forming two lobes, which, before they open to give forth the pollen, are again divided into two cell-like parts, and at the time of their maturity open by longitudinal clefts, by pores, or by valves, to scatter the pollen, which is conveyed to the stigma either by its own falling, by the wind, or by the insects which seek honey in flowers. See PISTIL. The pollen consists of single cells, which are usually free; more rarely,

Stamens.

the pollen of each cell is united into a mass, called the *pollen-mass* or *pollinium*, as in the *Orchideæ* and *Asclepiadaceæ.* The stamens are either found along with the pistil in the same flower, and are then arranged around it, in which case the flower is *hermaphrodite;* or they are placed by themselves in separate flowers, which are therefore called *male* flowers. The stamens are sometimes united together, generally by the filaments, which form a tube, and the flower is *monadelphous;* sometimes, by their union, they form two sets, when the flower is *diadelphous;* sometimes three or more, when it is *polyadelphous;* and the filaments are sometimes united with the pistil into a column, from which the anthers spring, as if they grew from the pistil, when the flower is *gynandrous.* See BOTANY. The stamens form either one or more whorls, and when in one whorl are either opposite to the petals or alternate with them. The latter is regarded as their normal position. Sometimes, by abortion, there is only one stamen. Being leaf-organs, stamens arise from the axis; but they very frequently grow upon the corolla, so that they seem to derive their origin from it. When the stamens seem to arise from the corolla or from the calyx, they, and also the flower, are said to be *perigynous* (Gr. *peri*, around, and *gyne*, a wife); when they grow from the pistil, they are *epigynous* (Gr. *epi*, upon); and when from beneath it, *hypogynous* (Gr. *hypo*, under). These distinctions have been much made use of, by Jussieu and others, in classification. The transition of petals into stamens can be easily traced in some flowers, for example, in the Water Lily. In double flowers, the stamens have been changed into petals. Linnæus adopted the stamens as the means of his division of plants into classes (see BOTANY); but in so far as the classification was founded on their mere number, it was artificial, the number of stamens being various in plants very closely allied. Stamens are among the organs of plants which most frequently display Irritability (q. v.).

The filament assumes a great variety of forms. Sometimes it is short and thick, sometimes long and slender; sometimes dilated at the base; sometimes petal-like, with the stamen at its tip; sometimes forked, or divided into three teeth, of which the central one bears the anther; sometimes bent or jointed, sometimes spiral. The form of the anther varies still more than that of the filament; indeed, the variety of forms is endless. The *connective* is a body which unites the lobes of the anther. When the filament is continuous with the connective, the anther-lobes seeming to be united to it through their whole length, the anther is said to be *adnate* or *adherent;* when the filament ends at the base of the anther, the anther is *innate* or *erect.* In many flowers, as in those of grasses, the anther is attached to the filament by a mere point, and is very movable, easily turned by the wind. It is then said to be *versatile.*

STA'MFORD, an ancient market-town and a parliamentary and municipal borough of Lincoln, on the Welland, which is navigable hence to the sea, 11 miles north-west of Peterborough. Agriculture is almost the exclusive pursuit of the inhabitants of the district around, and S. is chiefly remarkable for its ancient remains. It first appears in history in 449, when the Britons and Saxons here defeated the Picts and Scots. Many of the Jews of S. were slain, and the whole community plundered in 1190 by those who had enlisted for the Crusade. In the middle ages several parliaments and councils were held here, and the town contained about 16 churches, and a number of religious houses. In 1572, a number of Flemish Protestant refugees settled here, and introduced the weaving of silk and serge. Portions of the walls and gates of the Carmelite and Franciscan priories, as well as other curious remains, are still extant. There are numerous schools and other important institutions. Pop. (1881) 8775. S. returns a member to the House of Commons.

STAMFORD, a township and borough of Connecticut, U. S., at the entrance of Mill River into Long Island Sound, 36 miles north-east of New York, on the New York and New Haven Railway. It is a favourite residence and summer resort of opulent

New Yorkers. It has 2 banks, newspaper, 8 churches, a small coasting-trade, and manufactures of iron, boots and shoes, dye-stuffs, carriages, coal oil, &c. Pop. in 1860, 7185; 1880, 11,298.

STA'MMERING AND DEFECTIVE SPEECH. Stammering is an affection of the vocal and enunciative organs, causing a hesitancy and difficulty of utterance, and respecting the nature and the origin of which a variety of different opinions has been entertained. Stammerers themselves often attribute the varying conditions of their impediment to causes which must be purely imaginary, such as the state of the wind, the changes of the moon, &c. There can be no doubt that the impediment is aggravated by depression of spirits, derangement of the digestive organs, physical debility, &c.; but these influences have nothing to do with the primary cause of the infirmity. A nervous dread of speaking is usually associated with stammering; but this is rather the result than the cause of the impediment. If constitutional nervousness were productive of stammering, the number of sufferers would be vastly greater, and it would include a larger proportion of females than of males; whereas the robust sex furnishes by far the greater number of cases; and it is noticeable, besides, that stammerers are not in general persons of weak nerves, otherwise than in connection with the act of speaking. Any physical defect will render a person nervous when the peculiarity is made a subject of observation, and it is in this way only that nervousness is associated with speech in cases of stammering. The strength of this impediment lies in *habit*, in mismanagement of the breath and the organs of utterance, rendered habitual before the development of reason and observation; and the removal of the defect depends on the acquirement of voluntary control over the mechanical agents of speech. The nervousness which unfits the stammerer for self-direction gradually subsides as his will attains a mastery over the processes of speech; and perseverance in a discipline of systematic and guarded utterance rarely fails to remove the impediment, and the fear which accompanied it.

The first manifestations of stammering usually take place during the weakness attendant on disease, or after a fall or sudden fright; but sometimes the impediment appears to arise from imitation, and children have been known to be infected by even the most casual example. Thus, when one member or visitor of a family stammers, the younger members of the family are very apt to be similarly affected. From this cause defects of speech run so much in families, that many persons have thought them to be hereditarily transmitted. This, however, is altogether a mistake. In the early stages, a little patient direction on the part of parents and nurses would suffice to check the tendency to stammer, and prevent the formation of the unfortunate habit.

Stammering generally begins about the fourth or fifth year of age; but harshness in checking children, or impatience in connection with messages or lessons, may induce the impediment at a considerably later period. Boys of ten or eleven years of age have been excited into the habit by injudicious hurry and peremptoriness at school. The little stammerer, when he cannot be more directly assisted, should be kindly counselled to take time and speak slowly, and he should by no means be ridiculed or reproved for what he cannot help, and is not taught how to avoid.

The varieties of stammering are so great, that scarcely two cases are found precisely alike. In some there is but little outward manifestation of effort; in others, the futile attempts are painfully demonstrative. The silent straining to speak causes the eyeballs to protrude, and the veins of the face and neck to swell, till relief from apparent choking comes in fitful, ungovernable bursts of sound. In almost all cases the head oscillates loosely on the neck, and is forced upwards by the misdirected current of breath; while the larynx, the organ of sound, is from the same cause agitated in continual efforts to ascend, and the voice is consequently abrupt and intermittent, and unnaturally acute. The muscles of the face participate in the general upward action, and sometimes the spasmodic contortions extend over the whole body, causing the stammerer to rock in his chair, or start wildly to his feet. These muscular disturbances arise simply from disordered respiration, and they disappear when the habit of closing the glottis and compressing the organs of articulation is overcome, and the air is allowed to pass freely in or out of the lungs.

The terms stuttering and stammering are often used synonymously, but the former term is properly, or, at least, conveniently, limited to a loose and imperfect action of the organs of articulation, as distinguished from the irregularity of breathing and the convulsive and choking symptoms which invariably accompany stammering. In stuttering, the organs meet and rebound again and again in reiteration of syllables before words can be fully formed. The source of this difficulty lies mainly in the lower jaw. When this organ is brought under control, and the effort of speech is transferred from the mouth to the throat—where all voice is formed—the power of fluency is readily obtained. But stuttering is rarely unaccompanied by some degree of spasmodic stammering, and the two forms of impediment, while theoretically distinct, are generally blended in mutual aggravation.

Stammering is, in nearly every case, perfectly curable, as it seldom arises from organic defect. The means of cure must, however, often be continued for a length of time before the stammerer is free from the danger of relapse. The best time for the cure is undoubtedly the earliest, before the habit has acquired full strength, and before the sufferer has endured the most grievous mortifications and drawbacks of the impediment. But the adult stammerer generally brings to the curative task a higher appreciation of its importance, and a greater care and concentration of effort than the child is capable of; and these qualities almost compensate for the disadvantage of long-established habit. Parents often unwisely defer the attempt to correct impediments of speech, in the hope that the defects will disappear as the child gains strength and reaches riper years. But the hope is very rarely realised; and were it otherwise, the misery of years of impediment, and the hindrance to education which stammering certainly involves, are evils to be avoided by all possible means. With this, as with all habits, 'prevention is better than cure;' and stammering would be easily and certainly prevented by timely advice carried out with ordinary care in the nursery.

The means that have been proposed for the cure of stammering have been as various as the theories of the nature of the defect; and sometimes the 'cure' has been apparently but little better than the disease. Drawling, singing, interpolations or elisions of letters, speaking with the teeth closed, or with the tongue pressed to the roof of the mouth, sniffling, whistling between words, beating time to utterance, stamping the foot, jerking the body, forks on the tongue, pebbles in the mouth, or tubes fixed between the organs, bands compressing the larynx, and other absurd and uncouth devices, have been, under cover of expedient secrecy, practised on unhappy stammerers. But the removal of this defect

as above shewn, depends on the skilful application of scientific principles, respecting which there is no mystery save that which arises from the little attention that has been paid to the science of speech.

From the preceding account of the nature of stammering, it is almost superfluous to add that the cure of this impediment does not fall within the province of surgery. Yet the barbarous operation of cutting a wedge from the root of the tongue—introduced from Germany about 30 years ago—and the equally futile and cruel operation of excising the tonsils, have been, within no distant date, extensively practised by surgeons in Great Britain.

The habit of stammering can only be counteracted by the cultivation of a habit of correct speaking; and the latter can only be acquired by studying the processes of speech, the relation of breath to articulate sounds, the positions of the tongue and the other oral organs in moulding the outward stream of air; and by a patient application of these principles in slow and watchful exercise. The lungs constitute a pair of bellows, and the mouth, in all its varying shapes, the nozzle of the bellows. The passage of the throat must be kept open, and the breath expelled by means of the ascent of the diaphragm, not by downward pressure of the chest. All sound originates in the throat, and all effort in speech must be thrown back behind the articulating organs, which must be kept *passive*, yielding to the air, always opening to give it exit, and never resisting it by ascent of the tongue or of the jaw. The head must be held firmly on the neck, to give free play to the attached organs; and the great principle must never be lost sight of that *speech is breath*; and that, while distinctness depends on precision and sharpness of the oral actions, *fluency* depends on the unrestrained emission of the material of speech—the air we breathe.

Besides stammering and stuttering, there are many other forms of vicious articulation, which are rather defects than impediments of speech. The elementary sounds most subject to mispronunciation are those of *r* and *s*, giving rise to the common defects of burring and lisping. Burring consists in vibrating the uvula or the edge of the soft palate, instead of the tip of the tongue; and lisping consists in applying the tongue to the teeth or the gum, so as to intercept the breath, and force it over the sides instead of the centre of the tongue. The sound of *l* also is often defective, *w*, *y*, *ng*, or a *vowel* being substituted for the lingual articulation. Other substitutions of one element for another are common, such as *t*, *d*, and *n*, for *k*, *g*, and *ng*; *s* or *z* for *th*; *s* for *sh*, &c. There are also defects which arise from organic malformation, and require the aid of surgery; as when fissure exists in the palate, and the breath cannot be enclosed behind the lips or tongue, but escapes into the nostrils; when the tongue is too closely tied to the bed of the mouth, and the tip cannot be raised to the palate; when the teeth are so irregular or abnormally numerous as to leave the tongue too little room to act, &c. In some cases the breath escapes into the nostrils when there is no organic cause for the peculiarity, and *r*, *l*, *s*, and other elements are nasally affected, merely from habit. The nasal passages are, in other cases, insufficiently free, and *m*, *n*, and *ng* are scarcely distinguishable from *b*, *d*, and *g*.

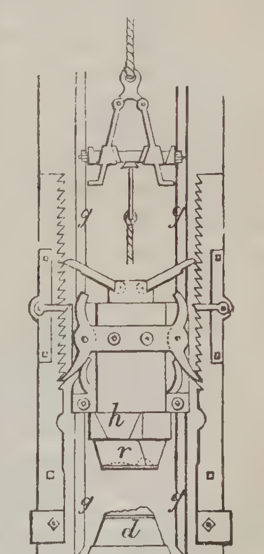
There are comparatively few persons who have perfect command over their vocal organs. Speaking, which is in reality an art, is exercised only as an instinct; and thus, as an eminent American author (Dr Rush) observes, 'some men only bleat, bark, whinny, or bray a little better than others.' It is some consolation to those who have been compelled by defects to study the art of speech, that they exercise the crowning faculty of man's nature more worthily than others, and thus become, perhaps, better speakers than they would have been without the stimulus of defect or impediment.

Speaking, when the respiration is properly conducted, is one of the most healthful exercises; but violent or long-continued effort is injurious to the chest, when the lungs are not kept well inflated. Frequently, also, under such circumstances, the vocal chords become permanently relaxed, and total loss of voice sometimes ensues.

The acquirement of the power of speaking in infancy is dependent on the possession of hearing, so that deaf children are also mute. Under proper training, however, they may be taught to articulate, as the organs of speech are very rarely imperfect. Children who have been subject to fits or other cerebral affections, or who are deficient in imitative power, are sometimes very backward in learning to speak. In such cases, great care is requisite to direct the early attempts, and prevent the formation of bad habits. Many of the worst forms of defect and impediment owe their origin simply to the want of proper direction in the production of elementary sounds, when the little sufferers have failed to enounce them correctly by natural imitation.

It is unnecessary to enumerate the various English, American, and foreign authors who have propounded conflicting theories of the cause, and schemes for the cure of impediments of speech. Of the systems practised in England at the present day, those of Dr Hunt and Mr Melville Bell have been most fully published. The views of these authors differ but little, and are in substance the same as those contained in this article.

STAMPING OF METALS. There are different kinds of stamping. The plan adopted for producing coins or medals is described under MINT, and the preparation of the dies used, under DIE-SINKING. For the ordinary stamped brass-work, so extensively made in Birmingham, a stamping-machine is employed, of which the essential parts are a *die*, a *reverse* or counter-die, and a *hammer*. It is shewn in the annexed figure; but the toothed rack, with arrangement for catching the hammer after it rebounds, is only used for special purposes. The die *d*, which is made of cast iron or steel, is fixed to the bottom of the stamp, and the reverse, *r*, is attached to the hammer *h*, which works between two guides *g*, *g*. Pieces of thin rolled brass are cut to size, and one placed upon the die; the hammer, with the counter-die, is now raised to a sufficient height by a windlass and rope, or other means, and allowed to fall, and thus force the thin plate into the die. The plates from the first blow are then annealed. Repeated blows and annealings follow until the article is 'brought up,' slight alterations



Stamping-machine.

in the reverse being from time to time required. Sometimes as many as 30 blows are necessary, but 10 or 12 strokes will suffice for an object with a considerable depth of raising. Globular articles are stamped in two or more pieces, and then soldered together.

The stamping process was first adapted to the production of hollow shapes in sheet-iron by Mr T. Griffiths, in 1841; and since then, the manufacture of such goods as dish-covers, basins, and teapots has been improved and extended to a surprising extent. In the case of a dish-cover, for example, a single sheet of iron is brought to the required shape by repeated stampings and burnishings upon a chuck. It is afterwards tinned with great ease, there being no joints to interfere with the operation; for the same reason, iron basins stamped out of a single sheet can be readily enamelled. The old way of forming these articles by hand-labour was very tedious and clumsy.

German silver is too brittle a metal to be stamped like brass or iron, consequently it has only hitherto been made into small objects, such as spoons and forks, by this process. But the Messrs Elkington of Birmingham are now making articles of considerable size in this material, by means of a stamping-press worked by hydraulic power. A number of graduated dies are used for one object, each pair coming gradually nearer the desired shape, but none of them making an impression deep enough to strain the metal.

For stamping-machines used in dressing metallic ores, see METALLURGY.

STAMPS, or STAMP DUTIES, are taxes imposed on all parchment and paper whereon private deeds or other instruments of almost any nature are written. It is a convenient mode of raising the public revenue, and was first instituted by a statute of 5 and 6 Will. and Mary, c. 21. A stamp tax was imposed for the first time by the United States after the war of the Southern rebellion.

STA'NCHIONS, or STANCHELS, upright iron bars fixed in the stonework to protect windows. They are sometimes let into the stone at top and bottom; sometimes at bottom only, and ornamented with fleurs-de-lis, &c., at top.

STA'NDARD. In its widest sense, a standard is a flag or ensign under which men are united together for some common purpose. The use of the standard as a rallying-point in battle takes us back to remote ages. The Jewish army was marshalled with the aid of standards belonging to the four tribes of Judah, Reuben, Ephraim, and Dan, and the Egyptians had ensigns with representations of their favourite animals. The flag of Persia was white, and, according to Xenophon, bore in his time a golden eagle with expanded wings; it was fixed on a chariot, and thus conveyed to the field of battle. Æschylus, in enumerating the six chiefs who, headed by Polynices, set themselves in battle array against Thebes, describes the device on the standard of each. In the earliest era of Roman history, a bundle of hay or fern is said to have been used as a military standard, which was succeeded by bronze or silver figures of animals attached to a staff, of which Pliny enumerates five—the eagle, the wolf, the minotaur, the horse, and the boar. In the second consulship of Marius, 104 B.C., the other animals were laid aside, and only the eagle retained; and down to the time of the later emperors, the eagle, often with a representation of the emperor's head beneath it, continued to be carried with the legion. On the top of the staff was often a figure of Victory or Mars. Each cohort had also an ensign of its own, consisting of a serpent or dragon woven on a square piece of cloth, and elevated on a gilt staff with a cross-bar. Under the Christian emperors, the *Labarum* (q. v.) was substituted for the imperial standard. Various standards of great celebrity occur in medieval history, among which may be enumerated the Flag of the Prophet (q. v.); the standard taken from the Danes by Alfred of England; and the Oriflamme, originally belonging to the Abbey of St Denis, and borne by the Counts of Vexin, which eventually became the standard of the French kingdom.

In strict language, the term standard is applied exclusively to a particular kind of flag, long in proportion to its depth, tapering towards the fly, and, except when belonging to princes of the blood-royal, slit at the end. Each baron, knight, or other commander in feudal times, had a recognised standard, which was distributed among his followers. The length of the standard varied according to the rank of the bearer. A king's standard was from 8 to 9 yards in length; a duke's, 7 yards; a marquis's, 6½ yards; an earl's, 6 yards; a viscount's, 5½ yards; a baron's, 5 yards; a banneret's, 4½ yards; and a knight's, 4 yards. There was never a complete coat-of-arms on the standard; it generally exhibited the crest or supporter with a device or badge of the owner, and every English standard of the Tudor era had the cross of St George at the head. Standards were registered by the heralds, and the charges on them selected and authorised by an officer of arms.

The so-called Royal Standard of Great Britain is more properly a Banner (q. v.), being a square flag with the national arms covering the entire field without any external accessories. The so-called cavalry standards in use in the British army are also in strictness banners. They are small in size; their colour is determined by the colour of the regimental facings, and they are charged with the cipher, number, insignia, and honours of the regiment. The banners of the household troops are, however, all crimson and richly embroidered with the royal insignia of England. Corresponding to the standards of the cavalry are the colours of the infantry regiments, of which each has 'a pair,' one, called the Queen's colour, being the Union Jack (q. v.), charged with some ornamental device; the other, the regimental colour, with the cipher, number, device, motto, and honours of the corps, cantoned with a small union jack. When a regiment obtains new colours, they are usually given by the wife of the colonel, or some lady of distinction.

STANDARD, BATTLE OF THE, a battle between the English and Scots which took place on Cutton Moor, near Northallerton, when the latter were defeated with great loss. On the usurpation of Stephen, David I. of Scotland, who, along with Stephen, had sworn to defend the rights of Matilda, daughter of Henry I., invaded England in pursuance of his oath, and compelled the barons of the northern part of the kingdom to swear fealty to that princess. After a war of nearly three years' duration, David encountered the English troops at Cutton Moor, on 22d August 1138, with a large but undisciplined army, who, partly in consequence of a rumour that the king was slain, were thrown into confusion, and the most disastrous rout followed, in which the Scots are said to have lost 10,000 men. The battle derived its name from the circumstance that a ship's mast, bearing on its summit the consecrated host, and surrounded by the banners of St Peter of York, St John of Beverley, and St Wilfred of Ripon, elevated on a wagon, marked the centre of the English army.

STANDARDS. In Carpentry, the quarters or

upright posts in wooden partitions are so called. The upright timbers to which doors are hung are called door-standards.

STANDING ORDERS is the name given to those permanent regulations which may be made by either House of Parliament for the conduct of its proceedings, and are binding on the House by which they are made as continual by-laws enduring from parliament to parliament unless rescinded. A standing order of the House of Lords, when rescinded, is said to be *vacated;* in the Commons the corresponding term is *repealed.* In the Lords, a motion for making or dispensing with a standing order cannot be granted on the same day that the motion is made, or till the House has been summoned to consider it; and every standing order, as soon as agreed to, is added to the 'Roll of Standing Orders,' which is carefully preserved and published from time to time. In the House of Commons there was, until 1854, no authorised collection of standing orders, except such as related to private bills. In that year a manual of rules, orders, and forms of proceeding relative to public business was drawn up and printed by order of the House.

Standing orders are occasionally suspended when it is desirable that a bill should be passed with unusual expedition.

STANDING STONES. Large rude unhewn blocks of stone, artificially raised to an erect position at some remote period, have been found in almost every part of the world where man has fixed his habitation. We find them in Britain, in continental Europe, in Assyria, India, Persia, and even in Mexico, and they are generally of such a size that their erection presupposes some degree of skill in the use of mechanical power. They are especially abundant in the British Isles, where they sometimes stand singly, and sometimes in more or less regular groups; and it was long the general opinion of archæologists that they were connected with the Druidical worship of the Celtic races. The result of modern investigation has been to throw doubts on the Druidical theory, while no other explanation has been given which is in all cases satisfactory. The erection of a large stone not easily shifted from its place is perhaps the earliest mode which man's instinct would contrive of preserving the memory of an event or of a hero; and there can be no doubt that many of these monoliths mark the site of a grave or of a battlefield. Human skeletons, and bronze and iron weapons, have been in numerous cases found underneath them. A traditional remembrance of this origin is preserved in the name of 'Cat Stane' (from Celtic *cath,* battle), given to some of them in Scotland, and 'bauta stein' (battle stone) in Norway. Another possible purpose is preserved in the Scottish name of 'hair stane,' or boundary stone, by which they are occasionally known; not a few of them, whatever their original object, having been long used as landmarks, and being alluded to as such in very early charters. A third use of these monoliths is at least as old as the historical books of the Old Testament. We read in Judges ix. 6, of Abimelech being made king 'by the pillar which was in Shechem,' and in 2 Kings xi. 14, of Joash, when he was anointed king, standing 'by a pillar, as the manner was;' and a like usage prevailed in ancient Britain, where the king or chief was elected at the 'Tanist stone' (from *Tanist,* the heir-apparent among the Celts), and there took a solemn oath to protect and lead his people. A very celebrated stone of this kind was the Lia Fail of Ireland, which was brought to Icolmkill for the coronation of Fergus Erc; and after being removed to Scone, became the coronation stone of Scotland, till conveyed away by Edward I. to Westminster, where it now forms part of the coronation chair of the sovereigns of the United Kingdom. In all these cases there is an idea of a solemn religious sanction attached to the stone; and a peculiar degree of sacredness seems to have invested any contract entered into at one of those perforated stones which are or were occasionally to be met with in England and Scotland. Such a stone, with an oval hole large enough to admit a man's head, till lately adjoined the monolithic group of Stennis in Orkney. It was known as the 'Stone of Odin,' and continued till the middle of last century to be the scene of the interchange of matrimonial and other vows, he who broke the vow of Odin being accounted infamous. It is said to have been the popular belief that any one who had in childhood been passed through the opening would never die of palsy. The power of curing rheumatism was ascribed to a perforated stone at Madderty in Cornwall. While many of the monoliths in Britain are undoubtedly of a very remote age, there are some indications that the practice of erecting them continued for a time after the introduction of Christianity, and that they were used to subserve purposes connected with the new faith. A series of monoliths in the island of Mull are traditionally said to have been guide-posts to pilgrims visiting Iona, and it has been suggested that they point out the route which St Columba must have pursued on his way to the residence of the Pictish king, Brude Mac Meilochon.

Still more puzzling to archæologists than the single monoliths are the large symmetrical groups of them, of which the most remarkable are Stennis in Orkney, Stonehenge and Avebury in Wiltshire, and Carnac in Brittany; all which, till lately, existed comparatively entire, though they have all been in the memory of the present generation more or less despoiled for building purposes. The most imposing of these monuments is Stonehenge (q.v.). At Stennis, from 70 to 80 stones were grouped in two separate circles of 360 and 100 feet diameter respectively, the largest stones being in the smaller circle. At Avebury, two double concentric circles were surrounded by an outer circle of 100 stones, the whole being approached by two long avenues of stones in double lines. In all these, and other instances, the circles were surrounded by a trench

Standing Stones of Stennis.

and mound. At Carnac the stones are placed not in circles but in straight lines, with a curved row at one end—an arrangement which has suggested the idea of a burial-place on the site of a great battlefield. All around Carnac, as well as Stonehenge,

Barrows and Cromlechs (q. v.) are to be found. While the popular notion of all these monuments is that they were Druid temples, the circular form so frequent among them has also suggested the idea that they may originally have been connected with the worship of the sun, and it is not impossible that they may have been used in turn for the successive religious worship of different races. They seem also to have served the purpose of courts of justice, or battle-rings for the duel and judicial combat. See STONEHENGE.

A remarkable description of monument, whose purpose is utterly unknown to us, is the *Rocking-stone* or *Logan-stone* (q. v.). Standing stones ornamented with a peculiar description of sculpture are found largely in Scotland. See SCULPTURED STONES.

STANFIELD, CLARKSON. See SUPP. in Vol. X.

STANHOPE, LADY HESTER LUCY, the eldest daughter of Charles, third Earl Stanhope, and his wife Hester, daughter of the great Lord Chatham, was born on the 12th March 1776. She grew up to be a woman of great personal charm, and of unusual force and originality of character. Very early she went to reside with her uncle, William Pitt, and as mistress of his establishment, and his most trusted confidant during his season of power, and till his death, she had full scope for the exercise of her imperious and queenly instincts. On the death of Pitt, a pension of £1200 a year was assigned her by the king. Mr Fox proposed to provide for her much more munificently, but she proudly declined his offers, as unwilling to accept benefit at the hands of the political enemy of her dead uncle. The change from the excitements of a public career, as it might almost be called, to the life of an ordinary woman of her rank with means somewhat insufficient, was naturally irksome to her, and in 1808, she was tried still further by the death, at Coruña, of her favourite brother Major Stanhope, and of Sir John Moore, for whom she is known to have cherished an affection. The precise relations between them have never been made known; but the last words spoken by the dying hero were: 'Stanhope' (a Captain Stanhope of his staff, who stood by him), 'remember me to your sister.' Conceiving a disgust for society, she retired for a time into Wales, and in 1810, she left England never to return to it. In mere restlessness of spirit she wandered for a year or two on the shores of the Mediterranean, and finally settled herself among the semi-savage tribes of Mount Lebanon. Here she led the strangest life, adopting in everything the Eastern manners, and by the force and fearlessness of her character, obtaining a curious ascendency over the rude races around her. She was regarded by them with superstitious reverence as a sort of prophetess, and gradually came so to consider herself. With the garb of a Mohammedan chieftain, she adopted something of the faith of one, and her religion, which seems to have been sincere and profound, was compounded in about equal proportions out of the Koran and the Bible. Her recklessly profuse liberalities involved her in constant straits for money; and her health also giving way, her last years were passed in wretchedness of various kinds, under which, however, her untamable spirit supported her bravely to the end. She died in June 1839, with no Frank or European near her, and was buried in her own garden. The main sources of information about her are the notes of the frequent travellers who visited her in her strange seclusion, and the *Memoirs* derived from her own lips, and afterwards (3 vols. Lond. 1845—1846) published by a medical gentleman who went abroad with her, and from time to time lived with her in her retirement.

STANHOPE, PHILIP HENRY, EARL, historian and biographer, was descended from one of the best families of England, boasting three peerages—Chesterfield, Stanhope, and Harrington. This branch springs from the Stanhopes, Earls of Chesterfield. Its founder was the Hon. Alexander Stanhope, a distinguished diplomatist in the reigns of William III. and Queen Anne, who was son of the first Earl of Chesterfield by his second marriage. James, first Earl Stanhope, was an eminent military commander, who effected the reduction of the celebrated port of Mahon, in the island of Minorca, but who was subsequently with his army captured in Spain by the Duke of Vendome. He was the favourite minister of George I., who made him First Lord of the Treasury, and Chancellor of the Exchequer. He was created an earl in 1718. His statue, by Kent and Rysbrach, occupies a conspicuous place in Westminster Abbey. His grandson, the third earl, born 1753, and distinguished for his mechanical genius and scientific researches, died 1816. He was the inventor of a printing-press which bears his name, an arithmetical machine, and a monochord. This Lord S. was connected with the Pitts by marriage, having married Lady Hester Pitt, daughter of the great Earl of Chatham. Lady Hester Stanhope (q. v.) was a daughter of this marriage.

The subject of this notice, only son of the fourth earl, was born at Walmer, 1805. His courtesy title was Viscount Mahon. He received a private education, but graduated at Oxford, where he took his B.A. degree, 1827; created D.C.L., 1834. He entered the House of Commons in 1830 for Wooton Bassett, and afterwards sat for Hertford from 1835 to 1852. He was greatly instrumental in 1842 in securing the passing of the Copyright Act (q. v.); was Under-secretary for Foreign Affairs during the brief Peel administration, 1834—1835; and Secretary to the Indian Board of Control under the same minister, 1845—1846. He was a moderate Conservative in politics, and was warmly attached to Sir R. Peel, who named him one of his literary executors. His contributions to history are numerous and valuable. Macaulay, in a review of one of his earliest works, the *War of the Succession in Spain*, accredits him with some of the most valuable qualities of a historian, viz., perspicuousness, conciseness, 'great diligence in examining authorities, great judgment in weighing testimony, and great impartiality in estimating characters.' His most considerable work, *A History of England from the Peace of Utrecht to the Peace of Versailles* (1713—1783), in 7 vols., is a valuable contribution to modern history. His *Life of the Right Hon. W. Pitt* is better than that of Gifford, and more complete than that which was interrupted by the death of Bishop Tomline. S. had access to the entire series of letters from George III. to his favourite statesman; Pitt's familiar letters to his mother and elder brother; and his confidential correspondence with his friend and colleague Dundas deposited at Melville Castle and Arniston, near Edinburgh. His other works include a *History of Spain under Charles II.*, being for the most part extracts from the correspondence of the Hon. Alexander Stanhope, British minister at Madrid from 1690 to 1700; a *Life of the Great Condé*; a *Life of Belisarius*; a volume of *Historical and Critical Essays*, contributed to the *Quarterly Review*, and containing the *Story of Joan of Arc*, since reprinted separately; and a volume of *Miscellanies*. Of the *Life of Condé*, it may be remarked that it was originally written by the author in the French language, and that the English work is really a translation, executed under his superintendence

He also, in conjunction with the Right Hon. E. Cardwell, and under the title of *Memoirs of Sir R. Peel*, published the narratives drawn up by that minister on the Roman Catholic Question; the Peel Ministry of 1834—1835; and the Corn Laws. S. also published an edition of *Lord Chesterfield's Letters*, prefixed to which is the sketch of Lord Chesterfield's life and character, published in his *History of England*. He was mainly instrumental in procuring the appointment of the Historical Manuscripts Commission. He was elected President of the Society of Antiquities, 1846; Lord Rector of the University of Aberdeen, 1858; and one of the six foreign members of the Academy of Moral and Political Sciences at Paris, May 11, 1872. He died December 24, 1875.

STANISLA'WOW, or STANISLAU, a town in the Austrian crownland of Galicia and Lodomeria, pleasantly situated between two branches of the Bistricza, 75 miles south-east of Lemberg. It is the seat of active trade and manufactures. Pop. 13,047.

STANLEY, THE RIGHT HON. EDWARD HENRY SMITH, Earl of Derby, an eminent English statesman, eldest son and heir of the 14th Earl of Derby (q. v.), was born at the family-seat, Knowsley Park, Lancashire, July 21, 1826, was educated at Rugby, and at Trinity College, Cambridge, where he concluded a distinguished university career by taking a first class in classics in 1848, together with a declamation prize and mathematical honours. He early adopted the profession of statesmanship, and especially applied himself to the study of social and economical questions. During his absence on a tour in Canada, the United States, and the West Indies, he was elected (December 1848) M.P. for King's Lynn, on the death of Lord G. Bentinck. He afterwards visited the East, and was still in India when his father received the Queen's commands to form an administration, in which S. was appointed Under-secretary for Foreign Affairs. In 1855, on the death of Sir W. Molesworth, Lord Palmerston paid him the compliment of offering him the seals of the Colonial Office. The offer was declined; but in 1858 he was appointed to the Secretaryship of the Colonies in Lord Derby's administration, and was soon called upon to succeed the Earl of Ellenborough (q. v.) as President of the Board of Control for the affairs of India. The great Indian mutiny had not yet been quelled, and it devolved upon S. to frame resolutions and bring in a bill abolishing the East India Company (q. v.), and transferring their Indian possessions to the direct government of the crown. This duty he performed with consummate ability. The great mutiny was put down during his secretaryship, and in February, 1859, he had to meet the legacy of financial disorganisation which it bequeathed. The Derby government resigned before S. could carry out his plans for establishing the finances of India on a sounder basis, but he gave effective support to his successor in office, in reducing the military expenditure, and by other measures of administrative improvement. When his party went into opposition he kept himself resolutely in the background. On the formation of a new ministry by his father, in June, 1866, he was made Secretary of Foreign Affairs, which office he held until 1868. In May, 1867, he presided at the European conference which met in London to settle the dispute between France and Prussia. He favoured the abolition of church rates, and has been described, with apparent truth, as 'by nature—and, as it would seem, by opinion—a cold, strong-headed reasoning Liberal.' In April, 1869, he was installed Lord Rector of the University of Glasgow, and in October of the same year, on the death of his father, he became Earl of Derby, and took his seat in the House of Lords. On the formation of another Conservative cabinet in 1874 by Mr Disraeli, he was reinvested with the Secretaryship of Foreign Affairs. He has distinguished himself by the support he has given to Workingmen's Institutes, and to the cause of popular education. His speeches are remarkable for admirable good sense and practical philosophy.

STANLEY, THE VERY REV. ARTHUR PENRHYN, D.D., an eminent scholar and divine of the Church of England, was the son of the late Edward Stanley D.D., Bishop of Norwich, and nephew of the lat Lord Stanley of Alderley. He was born 13th December, 1815, while his father was rector of Alderley, and resided there. Educated at Rugby under the care of Dr Arnold, he passed (1834) as an Exhibitioner to Balliol College, Oxford, where he achieved a brilliant reputation, winning the Ireland Scholarship, and taking a first class in classics (1837), the Latin essay prize (1839), and the English essay and theological prizes (1840). In 1838 he was chosen a Fellow of University College, of which he was tutor and examiner for many years. Appointed Canon of Canterbury (1851), Professor of Ecclesiastical History at Oxford, Canon of Christ Church, and Chaplain to the Bishop of London (1858), he succeeded Archbishop Trench in 1864 as Dean of Westminster. He was also chaplain to the Prince of Wales, and chaplain-in-ordinary to the queen. In 1863 he married Lady Augusta Bruce, daughter of the 7th Lord Elgin. S. was one of the most accomplished and liberal theologians of the present age, and may be fairly regarded as the leader of the 'Broad Church' party, having taken an active part in the formidable minority within the church of the upholders of Bishop Colenso. In virtue of his great literary genius, his solid acquirements, his manly sense, and his sympathetic and generous piety, he ranked among the most eminent and estimable of Christian teachers. His principal writings, besides his contributions to Smith's Classical Dictionaries, are the *Life of Dr Arnold* (1844), *Sermons and Essays on the Apostolical Age* (1846), *Memoir of Bishop Stanley* (1850), *The Epistles to the Corinthians* (2 vols. 1854), *Sinai and Palestine* (1855), *Sermons on the Unity of Evangelical and Apostolical Teaching* (1859), *Lectures on the Eastern Church* (1861), *Lectures on the Jewish Church* (1863–1865), *Sermons on various Subjects preached before the University of Oxford* (1860–1863), *Memorials of Westminster Abbey* (1867), *The Three Irish Churches* (1868), *Essays on Church and State* (1870), *The Athanasian Creed* (1871), and *Lectures on the History of the Church of Scotland* (1872). He died July 18, 1881.

STA'NNARIES (Lat. *stannum*, tin), the mines from which tin is dug. The term is most generally used with reference to the peculiar laws and usages of the tin mines in the counties of Cornwall and Devon. By an early usage peculiar to these counties, the prerogative of the crown, elsewhere reaching only to gold and silver mines, is extended to mines of tin, which are the property of the sovereign, whoever be the owner of the soil. A charter of King John to his tinners in Cornwall and Devonshire, of date 1201, authorised them to dig tin, and turf to melt the tin, anywhere in the moors, and in the fees of bishops, abbots, and earls, as they had been used and accustomed—a privilege afterwards confirmed by successive monarchs. When Edward III. created his son, the Black Prince, Duke of Cornwall, he at the same time conferred on him the Stannaries of Devon and Cornwall, which were incorporated in perpetuity with the duchy. Their administration is committed to an officer called the Lord Warden of the Stannaries, who has two substitutes or vice-wardens, one for Cornwall, and

as

one for Devon. In former times, representative assemblies of the tinners (called parliaments) were summoned by the warden under a writ from the Duke of Cornwall, for the regulation of the stannaries and redress of grievances: the last of them was held in 1752. The Stannary Courts are courts of record held by the warden and vice-warden, of the same limited and exclusive character as the Courts-palatine, in which the tinners have the privilege of suing and being sued. They were remodelled and regulated by acts 6 and 7 Will. IV. c. 106, 2 and 3 Vict. c. 58, and 18 and 19 Vict. c. 32. The last-mentioned statute provides, that from all the decrees and orders of the vice-warden on the common law side, there shall be an appeal to the Lord Warden, who is to be assisted by two assessors, members of the Judicial Committee of the Privy Council, or judges of the High Court of Chancery, or Court of Common Law at Westminster; and from the Lord Warden there is a final appeal to the Judicial Committee of the Privy Council.

In the county of Cornwall, the right to dig tin in unenclosed or 'wastrel' lands within specified bounds may be acquired by one who is not the owner of the lands, on going through certain formalities, the party acquiring this right being bound to pay one-fifteenth to the owner of the lands. An ancient privilege, by which the Duke of Cornwall had the right of pre-emption of tin throughout that county, has long fallen into abeyance; and certain duties to which he was entitled on the stamping or coinage of tin were abolished by 1 and 2 Vict. c. 120.

STA'NNIC ACID. See TIN.

STANOVOI', or STANOWOI KHREBET (Framework Mountains), an extensive mountain chain in Siberia, in the extreme north-east of Asia, forms the watershed between the rivers which flow north into the Arctic Ocean, and those which are tributary to the Amur. The chain extends in an east-north-east direction from the Transbaikal territory along the shores of the Sea of Okhotsk, separating into several branches, one of which stretches east to Behring's Strait. Of this great mountain chain, the length of which is estimated at 3000 miles, little is known further than that it is elevated and rugged, and that its peaks are covered with perpetual snow.

STA'NZA. See RHIME.

STAPE'LIA. See CARRION FLOWERS.

STAPHYLE'A AND STAPHYLEA'CEÆ. See BLADDER-NUT.

STAPHYLO'MA (from the corresponding Greek word, derived from *staphylē*, a bunch of grapes, or in this case, rather a grape at the end of a stalk) is a term employed by the oculist to signify any protrusion on the anterior surface of the eye. Staphyloma of the iris occurs when there is a protrusion of the iris through a perforation of the cornea, consequent either on ulceration or on a wound. Staphyloma of the cornea occurs when that coat of the eye is more or less completely destroyed, and when the cicatrix with which the iris has become covered is caused to protrude by the pressure of the fluids of the eye, in the form of an opaque white prominence. It is unnecessary to enter into details of the treatment of these affections, which must be left entirely to the hands of the surgeon.

STAPLE (A.-S. *stapel*, a prop, support; a heap, and hence a place where goods are stored up or exposed for sale), a term applied, in the commerce of the middle ages, in the first instance, to the towns in which the chief products of a country were sold, and afterwards to the merchandise that was sold at the staple towns. The staple towns, at first chosen from convenience, came in the course of time to be invested with important privileges. The staple merchandise of England has been enumerated as wool, wool-fells (i.e., sheepskins), leather, lead, and tin, to which have sometimes been added butter, cheese, and cloth. *Wool* was, however, in point of fact, a far more important article of export than any of the rest, and was really the subject of those multitudinous regulations which fixed the staple in particular towns, both of England and of the continent. Goods intended for exportation had, in the first instance, to be exposed for sale at the staple town; the principal purpose of this regulation being, probably, to restrict commerce to those places where the officers who collected the king's customs could superintend it. Another object kept in view in the provisions made in the 13th and 14th centuries with respect to the staple, was the encouragement of the resort of foreign merchants; indeed, greater privileges seem to have been accorded to the foreign than to the English merchants who attended the staple.

A tribunal of great antiquity, called the Court of the Staple, had cognizance of all questions which should arise between merchants, native or foreign. It was composed of an officer, called the Mayor of the Staple, re-elected yearly by the native and foreign merchants who attended the staple; two constables, appointed for life, also chosen by the merchants; a German and an Italian merchant; and six mediators between buyers and sellers, of whom two were English, two German, and two Lombard. The law administered was the *lex mercatoria*, and there was a provision that causes in which one party was a foreigner, should be tried by a jury one half of whom were foreigners. The most important legislative enactments regarding the Staple and the Court of Staple were the Statute of Acton Burnel (11 Edward I.), by which merchants were enabled to sell the chattels of their debtor, and attach his person for debt; 13 Edw. I. c. 3; and 27 Edw. III. c. 2, called the Statute of Staple, one object of which was to remove the staple formerly held at Calais to certain towns in England, Wales, and Ireland. With the growth of commerce the staples became more and more neglected, and at last fell altogether into disuse.

STAR, in Heraldry. The star is of frequent occurrence as a heraldic bearing; it sometimes represents the heavenly body so called, and sometimes the rowel of a spur. In the latter case, it is blazoned a *Mullet* (q. v.). Stars of more than five

Stars.

points should have the number of points designated, and the points may be wavy. A star, or *estoile*, with wavy points, is often designated a blazing star; and when the points are more than six in number, it is usual to represent only every second point as waved.

The star is a well-known ensign of knightly rank. A star of some specified form constitutes part of the insignia of every order of knighthood.

STAR, ORDER OF THE, an order of knighthood formerly existing in France, founded by John II. in 1350, in imitation of the then recently instituted order of the Garter in England. The ceremony of installation was originally performed on the festival

of the Epiphany and the name of the order is supposed to have been allusive to the Star of the Magi.

STARAI'A-RU'SSA, a town of Russia, on a tributary of Lake Ilmen, 184 miles south-south-east of St Petersburg. The town is remarkable for its salt springs, which attract many visitors in summer. The means of communication between St Petersburg and S., by the Moscow railway and the river Volkhov, are easy and rapid. Resident pop. upwards of 8700.

STAR ANISE. See ANISE.

STAR APPLE (*Chrysophyllum*), a genus of trees and shrubs of the natural order *Sapotaceæ*. The species are natives of tropical and sub-tropical countries. The S. A. of the West Indies (*C. Cainito*) is a shrub about eight or ten feet high. The fruit is large, rose-coloured, mixed with green and yellow; and has a soft sweet pulp of an agreeable flavour. Other species produce edible fruit.

STA'RBOARD. See LARBOARD.

STARCH, or **AMYLACEOUS MATTER** ($C_6H_{10}O_5$), is an organised substance of the class known as carbo-hydrates, which occurs in roundish or oval grains in the cellular tissue of certain parts of plants. It is very widely diffused through the vegetable kingdom, and is especially abundant in the seeds of the cereals, in the seeds of leguminous plants such as peas and beans, in the tuber of the potato, in the roots of arrowroot and tapioca, in the pith of the sago palm, &c. The grains of starch from the same kind of plant are tolerably uniform in size and shape, but vary in different species of plants from $\frac{1}{250}$th to less than $\frac{1}{3000}$th of an inch in diameter; and while some are circular or oval, others are angular: moreover, amongst other differences, some (chiefly the larger grains) exhibit a series of concentric rings, while in others no rings are apparent; and while the grains of potato-starch, if illuminated by polarised light, with a Nicol's prism placed between the object and the eye, present a well-marked black cross, in wheat-starch no such cross is perceptible.

Ordinary commercial starch occurs either as a white glistening powder, or in masses which are readily pulverised; and when pressed between the fingers it evolves a slight but peculiar sound. It is heavier than water, and is insoluble in cold water, alcohol, and ether. If, however, it be placed in water at a temperature of 150°, its granules swell from the absorption of fluid, and the mixture assumes a viscid, pasty consistence. Dilute acids rapidly induce a similar change, even without the agency of heat; and if heated with dilute sulphuric acid, the starch is first converted into dextrine, and finally into glycose or grape-sugar; and manufacturing chemists avail themselves of this property to obtain glycose on a large scale from starch. Starch dissolves in cold nitric acid, and on the addition of water to this solution, a white, tasteless, insoluble precipitate falls, which is known as *Xyloidin*, and explodes violently when struck by a hammer, or when heated up to about 350°. The composition of this substance is not positively known, but in all probability one or two equivalents of the hydrogen of the starch (most probably two) are replaced by a corresponding number of equivalents of peroxide of nitrogen (NO_2).

The reactions of starch with iodine and bromine are very remarkable. Iodine communicates to it a very beautiful purple colour, and hence starch-paste serves as a delicate test for free iodine. The purple colour which the iodine gives to the starch granules appears not to depend on a chemical combination, because on the application of heat the colour disappears, and reappears on cooling. Bromine communicates a brilliant orange tint to starch—a reaction by which the presence of free bromine may be readily detected. When heated to a temperature of from 340° to 400°, dry starch is converted into Dextrine (q. v.), or British gum. At a higher temperature, it undergoes decomposition, and yields on dry distillation the same products as sugar. When heated in steam under pressure, it also passes into dextrine, and finally into glycose. The addition of a little sulphuric acid hastens these changes.

During the germination of seed, the starch undergoes a kind of fermentation, and is converted into a mixture of dextrine and glycose. This change is due to the action of a peculiar ferment termed Diastase (q. v.), which exists in all germinating seeds during the process of growth, and is probably a mixture of albumen and gluten in a special stage of decomposition. Various animal matters, as, for example, saliva, pancreatic juice, the serum of the blood, bile, &c., exert the same action on starch as diastase. On treating starch with chlorine, a remarkable, colourless, oily fluid, *Chloral* (q. v.), is obtained. On prolonged exposure to the air, starch paste becomes acid, in consequence of the formation of lactic acid.

Starch is usually obtained by a simply mechanical separation of it from the other ingredients with which it is associated; advantage being taken of its insolubility in cold water. The details of the mode of separation vary according to the source from which it is procured. We extract from Miller's *Organic Chemistry* the method of procuring *potato-starch*: 'This variety is prepared on a large scale from potatoes, which contain about 20 per cent. of amylaceous matter. The cellular tissue of the tuber does not exceed 2 per cent. of the mass; whilst of the remainder about 76 per cent. consists of water, and the rest of small quantities of sugar, salts, and azotised matters. In order to extract the starch, the tubers are first freed from adhering earth by a thorough washing, and are then rasped by machinery. The pulp thus obtained is received upon a sieve, and is washed continuously by a gentle stream of water so long as the washings run through milky. This milkiness is due to the granules of starch which are held in suspension. The milky liquid is received into vats, in which the amylaceous matter is allowed to subside; the supernatant water is drawn off, and the deposit is repeatedly washed with fresh water until the washings are no longer coloured. The starch is then suspended in a small portion of water, run through a fine sieve to keep back any portions of sand, and after having been again allowed to settle, is drained in baskets lined with ticking; the mass is then placed upon a porous floor of half-baked tiles, and dried in a current of air, which is at first of the natural temperature; the drying is completed by the application of a moderate artificial heat' (pp. 100, 101). To obtain starch from wheat or rice, a more complicated process is required, as the large quantity of gluten which is associated with the starch in these grains requires to be removed either by fermentation, or, according to Jones's patent, by a weak alkaline solution, which dissolves the gluten, but does not affect the starch granules.

Commercially, there are two classes of starch—those used for food, and those used for manufacturing purposes. The former are treated under ARROW-ROOT (q. v.); the latter are chiefly made from wheat, rice, and potatoes; but in addition, large quantities of sago-starch are prepared in India and sent to Europe, and small quantities are from time to time prepared from other sources, such as the fruit of the horse-chestnut, &c.

The importance of starch becomes at once obvious when we consider that it may be regarded as the starting-point in the preparation of brandy and other forms of spirit, and of beer and porter, and that it enters largely into the great *saccharine* group, constituting one of the leading subdivisions of food. See DIGESTION. It is, moreover, largely employed as an article of domestic use for laundry purposes, and also in the manufacture of dextrine and grape-sugar.

We shall conclude with a few words on starch in its physiological and medical relations. It might have been inferred *a priori* that starch was an essential article of diet, from the fact of its abundant occurrence in edible vegetables, even if the fact had not been established by numerous physiological experiments. Thus various kinds of potatoes yield from 12 to 27 per cent. of starch; peas, 32½ per cent.; beans, 34 to 36 per cent.; wheaten bread, 53½ per cent.; wheaten flour, 56½ to 72 per cent.; oatmeal, 59 per cent.; ryemeal, 61 per cent.; barley-meal, 67 per cent.; maize, 81 per cent.; rice, 83 to 85 per cent.; and it occurs in even larger proportions in arrowroot, sago, and tapioca. In a state of health, the proper diet consists in the due admixture of the albuminous, saccharine (or starchy), oleaginous, and saline groups; but in certain forms of disease, an excess or a diminution of the starchy element is expedient. Thus, in cases of weak gastric digestion, it is not advisable to mix starchy food with the albuminous, as it soaks up the too scanty gastric juice without making any use of it. In such cases, moreover, articles of food like potatoes, new bread, pastry, &c., are apt to turn acid in the stomach, and check digestion. There are, again, some cases of gastric disorder in which a purely starchy diet is expedient. Thus, according to Dr Chambers, it is the best form of food 'during acute catarrhal bilious attacks at the commencement of treatment, in even chronic gastric cases, and whenever a dusky complexion, hypochondriasis, or general distress shew that arrested moulting has caused a collection in the body of effete tissues' (*Dietetics* in *Clinical Lectures*, 4th ed., p. 539). In the early stages of rheumatic fever and other acute diseases, it is usually expedient to limit the diet of the patient for a day or two to a purely starchy diet, such as arrowroot, tapioca, panado, &c. In returning from a purely starchy to a mixed diet, Dr Chambers suggests that such an arrangement shall be adopted as to prevent starchy and albuminous foods from being together in the stomach. For example, let the morning and evening diet be vegetable, with a mid-day meal of purely animal food. It should be recollected that although starch is converted into sugar by the saliva, pancreatic fluid, and intestinal juice (see DIGESTION), the change principally takes place from the action of the two last-named fluids in the small intestine. Hence, when the duodenum, jejunum, or ileum are morbidly affected, as in typhoid or enteric fever, in enteritis, in diarrhœa, &c., little or no starch should be given in the food.

Wheat-starch is the only variety of starch admitted into the Pharmacopœia. It is employed in medicine chiefly in the form of mucilage (prepared by triturating 120 grains of starch with 10 fluid ounces of distilled water gradually added, and boiling for a few minutes, constantly stirring). This preparation is used either alone or as a vehicle for more active agents, as an enema, in dysentery, diarrhœa, flatulent distention of the bowels, &c.; externally, it is used as an application to excoriations, to prevent bed-sores, &c., and as a basis for dusting-powders in various forms of discharging skin-diseases. Its use in Surgery for the construction of immovable bandages has been noticed in the article SPLINTS.

STAR-CHAMBER, a tribunal of considerable note in English history, which met in the old Council-chamber of the palace of Westminster, and is said to have its name from the circumstance that the roof of that apartment was decorated with gilt stars. It is generally supposed to have originated in early times out of the exercise of jurisdiction by the king's council, acting as the *concilium ordinarium* and not *privatum*. The powers of the council, however, had been abridged by several acts of Edward III., and had altogether greatly declined when act 3 Henry VII. c. 1, either revived and remodelled them, or instituted, according to the view taken by Mr Hallam, an entirely new tribunal. This statute conferred on the Chancellor, the Treasurer, and the Keeper of the Privy Seal, with the assistance of a bishop and a temporal Lord of the Council, and Chief-justices, or two other justices in their absence, a jurisdiction to punish, without a jury, the misdemeanours of sheriffs and juries, as well as riots and unlawful assemblies. Act 21 Henry VIII. c. 20, added to the other members of the court the President of the Council. Whether or not the above-cited act of Henry VII. meant to constitute a court distinct from the council, it is certain that, by the time of Elizabeth, the two jurisdictions were merged in one; and the resulting tribunal was, during the Tudor age, of undoubted utility as a means of bringing to justice great and powerful offenders who would otherwise have had it in their power to set the law at defiance. The civil jurisdiction of the Star-chamber, at that period, comprised controversies between English and foreign merchants, testamentary causes, disputes between the heads and commonalty of corporations, lay and ecclesiastical, and claims to deodands. As a criminal court, it could inflict any punishment short of death, and had cognizance of forgery, perjury, riots, maintenance, fraud, libels, conspiracy, misconduct of judges and others connected with the administration of the law, and all offences against the state, in so far as they could be brought under the denomination of contempts of the king's authority. Even treason, murder, and felony could be brought under the jurisdiction of the Star-chamber, where the king chose to remit the capital sentence. The form of proceeding was by written information and interrogatories, except when the accused person confessed, in which case the information and proceedings were oral; and out of this exception grew one of the most flagrant abuses of this tribunal in the later period of its history. Regardless of the existing rule, that the confession must be free and unconstrained, pressure of every kind, including torture, was used to procure acknowledgments of guilt; admissions of the most immaterial facts were construed into confessions; and fine, imprisonment and mutilation inflicted on a mere oral proceeding, without hearing the accused, by a court consisting of the immediate representatives of prerogative. The proceedings of the Star-chamber had always been viewed with distrust by the commons; but during the reign of Charles I., its excesses reached a height that made it absolutely odious to the country at large; and in the last parliament of that sovereign, a bill was carried in both Houses (16 Car. I. c. 10), which decreed its abolition.

STAR-FISH (*Asteriadæ*), a family of *Echinodermata* (q. v.), having in the centre of the body a stomach with only one aperture, but extending by two much-branched cæca, into each of the rays into

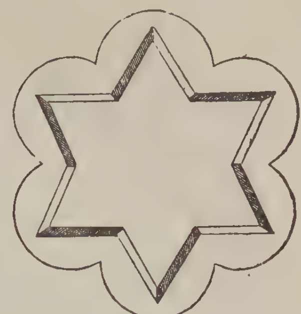
which the body is divided. In some, the central disc extends so as to include the rays, so that the general form is angular or lobed; in others, the disc is very small in comparison with the length of the rays. Locomotion is effected by very numerous Ambulacra (q. v.) placed in rows on the under side of the rays. A bony framework, of a vast number of pieces, extends to the extremity of each ray. The nervous system has its centre around the mouth, and sends a filament to each ray. Star-fishes are hermaphrodite, and produce vast numbers of eggs, which are retained for a time under the body of the parent, resting on the points of its rays at the bottom of the sea, and raising up the centre of the body, in order as it were to hatch them. The young are destitute of rays, and very unlike the mature form, so that their real nature was long mistaken. The mouth of star-fishes being on the under side, they seek their food—as indeed they perform all their motions—by crawling at the bottom of the sea, or on rocks, &c. They are very voracious, and

Star-fishes:

1, Common Cross-fish (*Uraster rubens*); 2, Gibbous Starlet (*Asterina gibbosa*); 3, Common Cross-fish, reproducing rays; 4, Eyed Cribella (*Cribella oculata*); 5, Lesser Sand-star (*Ophiura albida*).—From Forbes's *British Star-fishes.*

are troublesome to fishermen by devouring their bait. They possess, in a very high degree, the power of reproducing lost members; a disc with a single ray left will reproduce the other rays, and become a perfect star-fish. More extraordinary is the readiness which many of them display, particularly those with long and slender rays, in breaking off these members. Some species—BRITTLE STARS—can scarcely be procured for a museum in a tolerably perfect state, because they throw off ray after ray, and, in fact, break themselves to pieces upon any alarm. Star-fishes abound in the seas of all parts of the world. Almost no object is more familiar on the sea-coast of Britain than the COMMON S., CROSS-FISH, or FIVE FINGERS (*Asterias* or *Uraster rubens*), thrown up on the beach by the tide, or thrown out of fishing-boats in harbours. Some of the species are much larger; and some exhibit very beautiful colours; whilst others are interesting from their structure—the long serpent-like form of their rays, or the division of the rays by successive forkings, so that the whole creature is a globular mass, the surface of which is formed of a countless multitude of living tendrils.

STAR-FORT, in Field Fortification, is a strong work consisting of alternate salient and re-entering angles, arranged on a regular or irregular polygon. It is a common work for defending an eminence



Star-fort.

on a battle-field, or at the wing of a line, or as protection for the reserve-stores of an army.

STA'RGARD (Slav. *Starograd* or *Starigrod*, i. e., Old Town), a town of Prussia, province of Pomerania, is situated on the navigable river Ihna, 23 miles east-south-east of Stettin, with which, as with Posen and the whole east of Prussia, it is connected by railway. S. was formerly the capital of Lower Pomerania. It has various but not very important manufactures. Pop. 16,867. S. was raised to the rank of a town in 1129.

STAR JELLY. See NOSTOC.

STA'RLING (*Sturnus*), a Linnæan genus of birds, of the order *Insessores;* now the family *Sturnidæ*, nearly allied to *Corvidæ*, but in general of smaller size; the bill more slender and compressed, its point nail-like; the wings long and pointed. They are natives of almost all parts of the world, very generally gregarious, and some of them migratory. They feed on worms, insects, larvæ, and fruits. Some of them follow herds of quadrupeds, on account of the insects which attend them. The COMMON S. (*Sturnus vulgaris*) is a beautiful bird, rather smaller than the song-thrush or mavis, brown, finely glossed with black, with a pale tip to each feather, giving the bird a fine speckled appearance, particularly on the breast and shoulders; in advanced age it is more uniform in colour. The plumage of the female is less beautiful than that of

Starling (*Sturnus vulgaris*).

the male. Both sexes are more speckled in winter than in summer. The S. is abundant in most parts of Britain, and nowhere more so than in the

Hebrides and Orkneys. It is very abundant in the fenny districts of England. It is found in all parts of Europe, and throughout great part of Africa; and is also common in the north of Asia. Starlings make artless nests of slender twigs, roots, and dry grass, in hollow trees, in holes of cliffs, under eaves of houses, or, readily enough, in boxes, which are often placed for them in trees or elsewhere near houses. They unite in large flocks in autumn, and are readily known by their whirling mode of flight. The S. becomes very pert and familiar in confinement, displays great imitative powers, and learns to whistle tunes, and even to articulate words with great distinctness. Its natural song is soft and sweet.—The AMERICAN S., or MEADOW LARK (*S. Ludovicianus*), is larger than the Common Starling. It is common in the United States, migrating northwards in spring, and southwards in autumn, and congregating in great flocks in autumn and winter.

STARLINGS, in Architecture, are large piles driven in outside the foundations of the piers of bridges to break the force of the water and save the piers.

STAR-NOSE (*Condylura*, or *Astromyctes*), a genus of the Mole (q. v.) family, *Talpidæ*, having much general resemblance to moles, but with a longer tail, and an elongated slender muzzle, which bears at its extremity a remarkable structure of fleshy and somewhat cartilaginous rays disposed in a star-like form. The habits are very similar to those of moles. All the species of this genus are natives of North America. The best known is *Condylura cristata*, which inhabits Canada and the eastern parts of the United States.

STARODOU'B, a town of Little Russia, in the government of Tchernigov, and 100 miles north-east of the town of that name. It stands in the middle of a fertile district, but at a distance from any commercial highway. Pop. 12,474.

STAR OF BETHLEHEM (*Ornithogalum*), a genus of bulbous-rooted plants of the natural order *Liliaceæ*, nearly allied to Squills and Hyacinths.

Star of Bethlehem (*Ornithogalum umbellatum*).

The species are pretty numerous, natives almost exclusively of the eastern hemisphere, many of them of the Cape of Good Hope, and some of the south of Europe. The Common Star of Bethlehem (*O. umbellatum*), a native of France, Switzerland, Germany, the Levant, &c., is very common in flower-gardens. Its flowers are large, six to nine, in a corymbose raceme, white and somewhat fragrant. *Gagea lutea*, formerly *O. luteum*, with yellow flowers, is found in some parts of Britain in woods and pastures.

STAR OF INDIA, THE MOST EXALTED THE ORDER OF THE, an order of knighthood instituted by Queen Victoria in June 1861, with the view of affording the princes, chiefs, and people of the Indian Empire a testimony of her Majesty's regard, commemorating her Majesty's resolution to take on herself the government of India, and rendering honour to merit and loyalty. The order consists of

Star of India.

the Sovereign, a Grand-master, who is to be the Governor-general of India for the time being, and 25 knights, together with such extra and honorary knights as the crown may appoint. The members of the order are to be military, naval, and civil officers who have rendered important service to the Indian Empire, and such native chiefs and princes of India as have entitled themselves to her Majesty's favour. The insignia consist of a collar, badge, and star. The *collar* of the order is composed of the heraldic rose of England, two palm branches in saltire tied with a ribbon, and a lotus-flower alternating with each other, all of gold enamelled, and connected by a double golden chain. From an imperial crown, intervening between two lotus-leaves, depends the *badge*, consisting of a brilliant star of five points, and hanging from it an oval medallion, with an onyx cameo profile bust of Queen Victoria, encircled by the motto: 'Heaven's light our Guide,' in gold letters, on an enriched border of light-blue enamel. The *investment badge* is similar to the collar-badge, but with the star, the setting of the cameo, and the motto all of diamonds: it is worn pendent from a ribbon of pale blue with white borders. The *star* of the order is a five-pointed star or mullet of diamonds on an irradiated field of gold. Around it, on an azure fillet bordered with gold, is the same motto in diamonds, the whole encircled by wavy rays of gold.

STARS are distinguished from planets by remaining apparently immovable with respect to one another, and hence they were early called fixed stars, a name which they still retain, although their perfect fixity has been completely disproved in numerous cases, and is no longer believed in regard to any. Twinkling, or Scintillation (q. v.), is another mark which distinguishes stars from planets.

The first thing that strikes the observer is the apparent daily motions of the stars. The greater part appear to rise in the east, describe smaller or greater arcs in the heavens, and set in the west; while others describe complete circles round a point north of the zenith, that described by the so-called polar star being the smallest visible to the naked eye. These apparent motions arise from the rotation of the earth on its axis. Had the earth only this rotatory motion, the aspect of the starry heavens at any spot on the earth's surface would be the same at the same hour of the night all the year round; which is known not to be the case. In consequence of the earth's motion round the sun, or the apparent advance of the sun among the stars, the aspect of the heavens at a particular hour is always changing. The same position of the stars recurs four minutes earlier each night, and only at the same time after the lapse of a year.

With few exceptions, the *distance* of the fixed stars is still unknown, and must in all be enormously great. Since the time of Bradley, many attempts have been made to measure what is called the *yearly parallax* of the stars, and thus determine their distances. When we consider that the motion of the earth round the sun brings us at one time a whole diameter of its orbit (184 millions of miles) nearer to a particular region of the heavens than we were six months before, we should expect a change in the relative distances of the stars as seen from the two points—that as we approach them they should seem to separate. But no such change is seen to take place; and this was one of the early objections to the theory of Copernicus. The only answer that the Copernicans could give was, that the distance of the stars from us is so great that the diameter of the earth's orbit is as a point compared with it. The detection of the parallax of the fixed stars depended upon the perfection of instruments. The parallax of a star is the minute angle contained by two lines drawn from it, the one to the sun, the other to the earth. If that angle amounted to a second, the distance of the star would be 206,000 times that of the sun; and when the measurement of angles came to be reliable to a second, and still no parallax was discernible, astronomers could say that the distance of the nearest stars must be more than 206,000 times that of the sun—i. e., 206,000 times 92 millions of miles, or about 20 billions of miles. It is only since between 1832 and 1838 that anything like positive determinations of parallax have been made, chiefly by Henderson, Bessel, and Peters. The first published (Dec., 1838) was that of the double star 61 in the constellation of the Swan, by Bessel, who made the parallax 0″·37, giving a distance over 550,000 times that of the sun, or 52 billions of miles, so that the light of this star is about 8⅝ years in reaching the earth. The nearest of all the stars yet measured is *a Centauri*, the finest double star in the southern heavens, whose parallax was determined by Henderson and Maclear at the Cape of Good Hope to be 0″·9128 (the observations were made in 1832—1833; the result read before the Astronomical Society, Jan., 1839), or, as subsequently corrected, 0″·976, corresponding to a distance of about 20 billions of miles, and requiring 3⅛ years for its light to reach us. To Sirius, the brightest of the stars, a parallax of 0″·15, has been assigned, implying a distance six times that of *a* Centauri. 'It has been considered probable, from recondite investigations, that the average distance of a star of the *first* magnitude from the earth is 986,000 radii of our annual orbit, a distance which light would require 15½ years to traverse; and further, that the average distance of a star of the *sixth* magnitude (the smallest distinctly seen without a telescope) is 7,600,000 times the same unit—to traverse which, light, with its prodigious velocity, would occupy more than 120 years. If, then, the distances of the majority of stars visible to the naked eye are so enormously great, how are we to estimate our distance from those minute points of light discernible only in powerful telescopes? The conclusion is forced upon us that we do not see them as they appeared within a few years, or even during the lifetime of man, but with the rays which proceeded from them several thousands of years ago!'—Hind's *Astronomy*.

The stars have been divided into groups called Constellations (q. v.) from the earliest times. The several stars belonging to the same constellation are distinguished from one another by Greek letters, beginning the alphabet with the brightest; and when these are not sufficient, by Roman letters and by numbers. Many of the most brilliant stars have special names. They are also divided according to their brightness into stars of the first, second, third, &c., magnitudes—a division which is necessarily somewhat arbitrary. The smallest stars discernible by a naked eye of ordinary power are usually called stars of the fifth magnitude; but an unusually sharp eye can discern those of the sixth and even seventh magnitude. All below are *telescopic* stars, which are divided in a very undetermined way down to the twentieth magnitude. Sir J. Herschel has determined that the light of Sirius, the brightest of all the stars, is 324 times that of a mean star of the sixth magnitude. By processes of photometric observation and reasoning, it is concluded that the intrinsic splendour of α Centauri is more than twice that of our sun, and that of Sirius 394 times. Among stars of the first magnitude in the northern hemisphere are usually reckoned Aldebaran (in Taurus), Arcturus (in Bootes), Atair (in Aquila), Betelgeux (in Orion), Capella (in Auriga), Procyon (in Canis Minor), Regulus (in Leo), Vega (in Lyra). In the southern hemisphere are Achernes (in Eridanus), Antares (in Scorpio), Canopus (in Argo), Rigel (in Orion), Sirius (in Canis Major), Spica (in Virgo), and α Centauri and α Crucis that have no special names.

No apparent magnitude, in the proper sense of the word, has yet been observed in any star. In the best and most powerfully magnifying telescopes, even the brightest stars of the first magnitude appear, not with small discs as all the planets do, but as luminous points without any visible diameter, and always the smaller the better the telescope. We are therefore totally ignorant of the real size of the fixed stars; nor could it be determined though we were sure of their distances, for the apparent diameter is an essential element in the calculation. We cannot, then, say whether the greater brilliancy of one star, when compared with another, arises from its greater nearness, its greater size, or the greater intensity of its light, or from several of these causes together. It is, however, conjectured with reason that the fixed stars in general are not less than our sun, and that many, as Sirius, are much larger. It may be considered certain that none of the fixed stars shine with borrowed light; all are self-luminous.

The *number* of the stars is beyond determination. Those visible by the naked eye amount only to a few thousands. Stars of the first magnitude are usually reckoned at 15—20, of the second at 50—60, of the third about 200, of the fourth at 400—500, of the fifth at 1100—1200. But in the following classes, the numbers increase rapidly, so that stars of the sixth and seventh class amount to above 12,000. Stars are most dense in that region of the heavens called the Milky Way, which is

mostly composed of stars of the eleventh and twelfth magnitudes. W. Herschel observed 116,000 stars pass the field of his telescope in a quarter of an hour, while directed to the densest part of the Milky Way.

That the fixed stars are not really immovable, as their name would imply, is seen in the phenomenon of *Double* or *Multiple Stars*, which are systems of two or more stars that revolve about one another, or rather about their common centre of gravity. As they can be seen separate only by means of a telescope, and in most cases require a very powerful one, their discovery was possible only after the telescope was invented. Galileo himself discovered their existence, and proposed to make use of them in determining the yearly parallax of the fixed stars. After a long lapse of time, Bradley, Maskelyne, and Mayer again directed attention to the phenomena of double stars; but nothing important was made out respecting them till the elder Herschel made them the subject of a protracted series of observations, which led to the most remarkable conclusions as to their nature. The united observations of Struve, Savary, Encke, South, and especially those of Herschel the younger, continued for four years in the southern hemisphere at the Cape of Good Hope, have raised the number of observed double, or rather multiple, stars to more than 6000, of which the greater part are binary, or composed of two, but many are triple, some quadruple, and a few even quintuple, or consisting of five stars. The distance between the stars composing these systems is always apparently small (varying from less than 1″ up to 32″); but apparent nearness does not always constitute a double star, for two really distant stars are not unfrequently so nearly in the same line, as seen from the earth, that they appear to be close together. In real multiple stars, the individuals are not only comparatively near to one another, but they revolve around one another. Among stars of the first three magnitudes, every sixth is a multiple star; among the smaller stars, the proportion is much less. In some cases, one of the stars is much larger than the other, as in the star Rigel in Orion, and in the polar star; but oftener the connected stars are nearly equal in luminous power. The two members of double stars are mostly of one colour, but a difference of colour is observed in about one-fifth of the whole number. In many of these cases, the one colour is the complement of the other, and it is possible that the colour of the smaller star may be subjective, arising from the action of the other upon the eye.

It was in 1803, after 20 years' observation, that Sir W. Herschel advanced the view, which has been more and more confirmed since, that double stars are connected systems of two or more stellar bodies, revolving in regular orbits around one another, or rather round their common centre of gravity. Their motions are found to follow the same laws as prevail in the solar system, and the orbits are elliptical. These distant bodies are therefore subject to the Newtonian law of gravitation. The period of revolution has, in several cases, been roughly approximated; among the shortest is that of ζ Herculis, estimated at 30 years; others are set down at hundreds. In cases where the parallax is known, the size of the orbits can be determined; and thus the astronomer is able to assert in regard to the double star 61 Cygni that the orbit described by these two stars about each other undoubtedly greatly exceeds in dimensions that described by Neptune about the sun. Even the masses of these stars have been calculated as being together 0·353, that of our sun being 1. It is a consequence of these revolutions that many stars are now seen double that formerly seemed single, and *vice versâ*. If the plane of revolution have its edge presented to the earth, the stars will seem to move in a straight line, and at times to cover one another. The star ζ Herculis, seen by Herschel double in 1781, appeared single in 1802, and was first seen double again by Struve in 1826. The figure represents the relative positions of

Fig. 1.

the two stars composing γ in Virgo, at different times since the earliest observations. The period of revolution is presumed to be 182 years.

The *proper motion* of stars, discovered by Halley, is of another kind. It consists in a displacement in various directions of the individual stars, so that the configuration of constellations is slowly changing. 'The Southern Cross,' says Humboldt, 'will not always shine in the heavens exactly in its present form; for the four stars of which it consists move with unequal velocity in different paths. How many thousand years will elapse before its total dissolution cannot be calculated.' The proper motions yet observed vary from $\frac{1}{20}$th of a second to 7″·7. According to Bessel, the proper motion of the binary star 61 Cygni amounts to 5″·123, so that in 360 years it would pass over a space equal to the moon's diameter. It must thus take thousands of years to alter sensibly the aspect of the heavens; although, taking into account the enormous distances, the actual velocities must be great. Of 3000 stars observed by Bessel, 425 had a perceptible motion. Argelander has recently published a list of 560 stars having a proper motion.

It was first observed by Sir W. Herschel that there is a perceptible tendency in the stars generally to diverge or open up in one quarter of the heavens, and to draw together in the opposite quarter; and this he attributed to a proper motion of our sun with his planets in the direction of the former point. The apparent motion thus caused is complicated with the real independent motions of individual stars. The point towards which this motion is directed, which is called the 'solar apex,' was fixed by Herschel in the constellation Hercules; and the result of subsequent and independent researches gives a nearly coincident point. The velocity has been calculated at upwards of 150 millions of miles a year, or 17,600 miles an hour—i. e., rather more than one-fourth of the earth's velocity in its orbit.

The stars have not a uniform colour. This, as has been noticed, is the case with many of the double stars; but many single stars have a decided tint. 'Insulated stars of a red colour, almost as deep as that of blood, occur in many parts of the heavens; but no green or blue star (of any decided hue) has, we believe, ever been noticed unassociated with a companion brighter than itself.'—*Herschel.*

The relative brightness of stars appears to have altered. Of the two fine stars Castor and Pollux in Gemini, Castor was at one time the brightest, but now comes after Pollux; Aldebaran seems to have decreased, Atair (in Aquila) to have increased.

More striking than these gradual and not very well marked changes are the periodic alterations exhibited by several stars, hence called *variable* stars. A considerable number have been observed, of which the most remarkable are Mira (the 'wonderful') in Cetus, and Algol in Perseus. The first attains its greatest lustre every 334 days, and appears for 14 days as a star of the second, and even at times of the first magnitude; it then decreases for two or three months, till it becomes of the sixth and even tenth magnitude, so as to be for half a year invisible to the naked eye and usually to telescopes. After this it begins again to increase, but more rapidly than it decreased. It is visible to the naked eye for three or four months of its period. Of all the variable stars yet observed in Perseus, Algol has the shortest period, being 68 hours 49 minutes. It appears for about 60 hours a star of the second magnitude, then decreases for four hours, and appears for a quarter of an hour of the fourth magnitude, after which it increases again for four hours. Various explanations have been offered of these mysterious appearances; the stars are supposed to turn on their axes, and to have their surfaces unequally luminous in different places; or a large dark body is assumed to be revolving about the luminous one, so as to intercept more or less of its light in different positions; or the stars are lens-shaped, &c. There is nothing, however, inadmissible in the supposition that the intensity of the light itself may vary; and if in other suns, why not in our own?

Allied to the variable stars are the *new* or temporary stars that appear suddenly in great splendour, and then disappear without leaving a trace. A number of instances are on record. It is not impossible that these also may be periodic.

Star Systems.—From the appearances connected with the Milky Way or Galaxy (q. v.), Sir W. Herschel came to the conclusion that the stars forming our firmament do not extend indefinitely into space, but are limited in all directions, the mass having a definite shape. He conceived the shape to be something like that of a huge millstone, having one side cleft, and the two laminæ set apart at a small angle. Let the diagram (fig. 2) represent a vertical section of such a broad flat stratum, and suppose the solar system situated as at S, to a spectator looking on either side, in the direction of the thickness, as SB, the stars would appear comparatively sparse, but all round in the direction of the breadth (as SA) there would appear a dense ring, which would separate

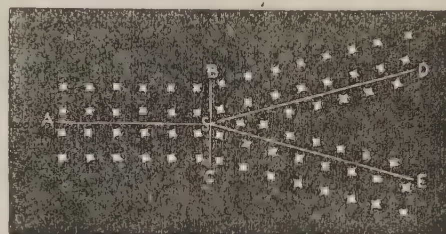


Fig. 2.

into two branches (SE, SD) in the direction of the cleft side. This supposition accounts for the appearance of the Milky Way, and all subsequent observations have tended to confirm the conjecture. Situated as we are within the system, we cannot hope ever to attain more than a rude notion regarding it; to get a definite outline we must be placed without it (see NEBULÆ).

But this star system, which we may call our own, as our sun belongs to it, is but an item in the stellar universe. The appearances known as nebulæ, for the most part at least, are believed to be similar agglomerations of suns, separated from our system and from one another by unfathomable starless intervals. Their forms are very various, but in general pretty well defined, and not without symmetry. The aspect of some of them is even

Fig. 3.

startling. A few specimens are given in the woodcut (fig. 3).

STAR-THISTLE. See CENTAUREA.

START POINT (A.-S. *steort*, a tail or promontory), a rocky headland in the south of Devonshire, with a lighthouse 204 feet above the sea, in lat. 50° 13′ 4″ N., and long. 3° 38′ W.

STARVA'TION, or INANI'TION, are terms applied to the phenomena resulting from an entire deficiency, or an insufficient supply of food. From M. Chossat's well-known experimental investigations of this subject (*Recherches Expérimentales sur l'Inanition*, Paris, 1843), it appears that the average loss of weight in mammals and birds, between the commencement of fasting and the death of the animal, was 40 per cent., the loss varying above and below 40 per cent. in the different organs and tissues, as shewn in the following table:

PARTS WHICH LOSE MORE THAN FORTY PER CENT.		PARTS WHICH LOSE LESS THAN FORTY PER CENT.	
Fat, ...	93·3	Muscular coat of Stomach,	39·7
Blood, ...	75·0	Pharynx and Œsophagus,	34·2
Spleen, . . .	71·4	Skin, ...	33·3
Pancreas, . . .	64·1	Kidneys, . . .	31·9
Liver, . .	52·0	Lungs, ...	22·2
Head, . . .	44·8	Bones, . . .	16·7
Intestines, . . .	42·4	Eyes, ...	16·0
Muscles of Locomotion,	42·3	Nervous System, .	1·9

Hence it appears that there is an almost complete removal of the fat, and a great reduction of the blood, while the nervous system is scarcely affected; and hence it would seem as if the supervention of death was coincident with the consumption of all the combustible materials of the body, and that previously the remaining nutritive force was concentrated on the nervous system.

The following are amongst the most prominent phenomena which Chossat observed either during the experiments or after the death of the animals: 1. Dropsical effusions. 2. Softening and destruction of the mucous membrane. 3. Blackening of the viscera, especially of the liver. 4. Bluish, livid, yellow, and reddish stains during life in the transparent parts of the skin. 5. Hectic fever, and a continuous decrease in the power of the body to resist cold. 6. At first a scanty excretion of dry, bilious, grass-green fæces, and afterwards diarrhœa of liquid saline matter. 7. Convulsions similar to those in death by hæmorrhage. 8. Death by starvation seems to be in reality death by cold; since the temperature of the body is not much diminished until the fat is nearly consumed, when it rapidly falls, unless it be kept up by heat applied externally. 9. Young animals succumbed far sooner than adults. 10. The results of insufficient food were in the end the same as those of total deprivation; the total amount of loss being almost the same, but the rate being less, so that a longer time was required to produce it.

Chossat did not find that much influence was exerted on the duration of life by permitting or withdrawing the supply of water; but there is no doubt that in man, and probably in mammals generally, death supervenes much earlier when liquids as well as solid food are withheld. For a full account of the symptoms of starvation as they occur in the human subject, we must refer the reader to the writings on hygiene and forensic medicine of Orfila, Rostan, Caspar, Taylor, &c.; and especially to Dr Donovan's account of the Irish famine of 1847, in the *Dublin Medical Press*, Feb. 1848, p. 67. The following are the most striking symptoms: In the first place, pain is felt in the stomach, which is relieved on pressure. The countenance becomes pale and cadaverous; the eyes are wild and glistening; the breath hot, the mouth parched, and the saliva thick and scanty. An intolerable thirst supervenes, which, if there be no access to water, becomes the most distressing symptom. The body becomes gradually emaciated, and begins to exhale a peculiar fœtor, while the skin becomes covered with a brownish dirty-looking and offensive secretion almost as indelible as varnish, which Donovan at first mistook for encrusted filth. The bodily strength rapidly declines; the sufferer totters in walking, like a drunken man; his voice becomes weak and whining, and he is ready to burst into tears on the slightest occasion. In the cases recorded by Donovan, imbecility, and sometimes almost complete idiocy, ensued, but in no instance was there delirium or mania, which has been described as a symptom of starvation in cases of shipwreck. On examination after death, the condition of the body is such as might be expected from Chossat's experiments, viz., extreme general emaciation; loss of size and weight of the principal viscera; almost complete bloodlessness, except in the brain; and the gall-bladder distended with bile, which tinges the neighbouring parts. Moreover, decomposition rapidly ensues.

It is impossible to fix the exact time during which life can be supported under entire abstinence from food or drink. Dr Sloan has given an account of a healthy man, aged 65, who was found alive after having been shut up in a coal mine for 23 days, during the first ten of which he was able to procure a small quantity of foul water. He was in a state of extreme exhaustion, and notwithstanding that he was carefully nursed, he died three days after his rescue. Dr Willan records the case of a young gentleman who, under the influence of religious delusion, starved himself to death. He survived for sixty days, during which time he took nothing but a little orange juice. In this case, life was probably abnormally prolonged in consequence of the peculiar emotional excitement of the patient. Judging from the cases of abstinence owing to disease of the throat and impossibility of swallowing, Dr Taylor infers 'that in a healthy person under perfect abstinence, death would not commonly take place in a shorter period than a week or ten days.'

It is worthy of notice that a deficient supply of food seems to check the elimination and removal of the effete materials of the body. This fact accounts not only for the tendency to putrescence, which is exhibited during the process of starvation, and for the rapidity with which putrefaction ensues after death, but for the pestilential diseases which almost always follow a severe famine; the excess of disintegrated matter in the blood rendering the system especially prone to the reception and multiplication of the diseases characterised as zymotic, such as fever, cholera, &c.


Statant.

STA'TANT, in Heraldry, a term applied to an animal standing still, with all the feet touching the ground. If the face be turned to the spectator, it is said to be *statant gardant*, or in the case of a stag, *at gaze*.

STA'TEMENT, in Scotch Law, is sometimes used technically to denote the account given before the sheriff by a person when arrested as a criminal. It is called the prisoner's declaration in England.

STATEN ISLAND, S. AM. See SUPP. in Vol. X.

STA'TEN ISLAND, a beautiful and picturesque island, which forms the western shore of the bay and narrows, and the southern shore of the harbour of New York. It contains 58½ sq. m., forming the county of Richmond, divided into five townships. Its shores are dotted with villages, and its heights crowned with villas. A narrow sound, the Kill van Kull, separates it from New Jersey. Four strong forts guard, with those on the opposite shores of Long Island, the entrance to the harbour, and the Hudson and East Rivers. It is also the site of a Seaman's Retreat, and Sailor's Snug Harbour, asylums for sick disabled seamen. Population in 1860, 25,493; in 1870, 33,029; in 1880, 38,994.

STATES, or ESTATES, in Politics, the name given to the classes of the population who either directly or by their representatives take part in the government of a country. In all European countries where the northern conquerors established themselves, the rudiments of representative government appeared in the form of assemblies brought together to deliberate with the sovereign on the common weal. These assemblies at first consisted of the two estates of the clergy and the nobility or baronage, who together constituted the whole free population of the realm; the nobility including not merely the greater barons, but the whole freeholders. As the burgesses gradually emancipated themselves, and rose into importance, they formed a third estate. In France, we find the *tiers état*, or citizens recognised in the States-general (q. v.) in 1302. In

Scotland, the earliest occasion on which the burghs are mentioned as attending and concurring in a grant of taxation, is in the Parliament held at Cambuskenneth in 1326, in which Robert Bruce set forth to the assembled estates the diminished condition of the royal income in consequence of the protracted struggle through which the country had come. The burgesses, represented by the commissioners for the burghs, continued in Scotland to be a separate estate, and were not, as in England, amalgamated with the knights and lesser barons, who, in the Scots parliament, were always classed with the baronage. The lesser barons were, however, first allowed, and latterly enjoined, to appear by representatives; and the three estates of clergy, barons, and burgesses all sat and deliberated in one house. In England, on the other hand, the knights and lesser barons were at an early period separated from the greater barons, and conjoined with the burgesses into the third estate, which occupied a separate chamber from the Lords Spiritual and Temporal. This peculiarity in the original constitution of the *tiers état* of England necessarily gave it a weight which it did not possess elsewhere, and exercised an important influence on the constitutional history of the country. As the peasants became emancipated, we also find them in some countries taking a share in the legislative power, either as a part of the *tiers état*, or, as in Sweden, forming a fourth estate. The four estates of nobles, clergy, citizens, and peasants are still recognised in Sweden; and in the Swedish legislature, as at present constituted, each has its separate chamber. Throughout Europe, except in Russia, Turkey, and some of the smallest German principalities, there are constitutional assemblies recognising more or less the co-operation of the estates with the sovereign in the legislative power. Some of these assemblies have but one chamber, but more of them have two. The lower chamber is always wholly, or partly, elective, but sometimes consists of separate delegates from the different orders of the community, as in Saxony, where there are representatives of landed proprietors, of towns, of peasants, and of traders and manufacture. The upper house, or senate, is in some constitutions hereditary: in some it consists of members named by the sovereign, or by the nobility, or some other class of the community, and often it combines these elements. In a few instances, as in the Netherlands and Brazil, it is elected by the same constituency as the lower house, and differs only in the higher property qualification required of its members.

STATES-GENERAL (Fr. *états généraux*), the name which was given to the convocation of the representative body of the three orders of the French kingdom; so named in contradistinction from the *états provinciaux*, or assemblies of the provinces. As far back as the time of Charlemagne, there were assemblies of clergy and nobles held twice a year to deliberate on matters of public importance; and in these assemblies the extensive body of laws bearing the name of the Capitularies of Charlemagne was enacted. The succeeding centuries, however, were adverse to free institutions; and these national convocations, becoming gradually less important, seem to have ceased to be held about 70 years after Charlemagne's death. From that time forward, there is no trace of any national assembly in France till 1302, when the *états généraux*, including the three orders of clergy nobles, and citizens, were convened by Philippe le Bel, with the view of giving greater weight to the course adopted by the king in his quarrel with Pope Boniface VIII. In 1314, we find the States-general granting a subsidy: during the reigns of Philippe IV. and his successor, the imposition of taxes by arbitrary authority was the subject of general discontent; and in 1355, the states were strong enough to compel the government to revoke the taxes so imposed. The States-general, however, though their consent seems in strictness to have been considered requisite for any measure imposing a general taxation, had, unlike the assemblies under the Carlovingian kings, no right of redressing abuses except by petition, and no legislative power. Under Charles VI. and Charles VII. the States-general were rarely convened, and it was often found more convenient to ask supplies from the provincial states. But as the royal authority increased, the formality of any convention of states general or provincial gradually ceased to be regarded as indispensable, and a final and unsuccessful struggle for immunity from taxation took place at the States-general of Tours in 1484. Louis XIII. convoked the States-general, after a long interval, in 1614, but dismissed them for looking too closely into the finances; and from that time down to the Revolution, the crown, with the tacit acquiescence of the people, exercised the exclusive powers of taxation and government. In 1789, the memorable convention of the States-general took place, which ushered in the Revolution. As soon as they had assembled, a dispute arose between the two privileged orders and the third estate as to whether they should sit and vote in one chamber or separately. The *tiers état*, of its own authority, with such deputies of the clergy as chose to join them—none of the nobles accepting their invitation—assumed the title of the *Assemblée Nationale*, a name by which the States-general had previously been sometimes designated. See ASSEMBLY, NATIONAL.

The name States-general is also applied to the now existing legislative body of the kingdom of the Netherlands (q. v.). It is so called in contradistinction from the provincial states, which are legislative and administrative assemblies for the several provinces.

STA'TICÉ, a genus of plants of the natural order *Plumbagineæ*, having a funnel-shaped, membranaceous, and plaited corolla; the flowers in spikes on one side of a panicled, leafless, flowering stem (*scape*). Several species are natives of Britain, growing near the sea, most of them on muddy shores and in salt marshes. The root of *S. Caroliniana*, called Marsh Rosemary, is used in North America for all the purposes of kino and catechu, and is a very powerful astringent.

Staticé Limonium.

STA'TICS (Gr. root *sta*, to stand), the science of the equilibrium or balancing of forces on a body or system of bodies, has gradually advanced from the days of Archimedes to the vast developments it has now acquired. Singularly enough, though most of its simpler theorems are

very generally known, are almost popular, in fact, there is no science in which elementary teaching is so defective. The ordinary proofs of its fundamental principles, such as the *Parallelogram of Forces*, the *Principle of the Lever*, &c., are usually founded on the supposition that a body in equilibrium is *absolutely at rest*. Now, any one who knows that the earth rotates about its axis, that it revolves about the sun, that the sun is in motion relatively to the so-called fixed stars; that *they* are, in all probability, in motion about something else which is itself in motion, &c., will at once see that there is no such thing as absolute rest, and that *relative rest* or motion, unchanged with reference to surrounding bodies, is all that we mean by equilibrium. He will then, at once, see that the foundations of statics are to be sought in the LAWS OF MOTION (q. v.). And, in fact, Newton's Second Law of Motion gives us the necessary and sufficient conditions of equilibrium of a single particle under the action of any forces; while his Third Law, with the annexed Scholium, gives these conditions for any body or system of bodies whatever.

The simplest statement of the conditions of equilibrium of a rigid body which can be given, is that furnished by this Scholium of Newton's, which is now known by the name of the Principle of Energy (see FORCE) or Work (q. v.). It is as follows: A rigid body is in equilibrium if, and is not in equilibrium unless, in *any* small displacement whatever, no work is done on the whole by the forces to which it is subject. In the case of what are called the *Mechanical Powers* (q. v.), this is equivalent to the statement, that work expended on a machine is wholly given back by the machine—or that the work done by the *power* is equal to the work spent in overcoming the *resistance*.

It is shewn in the geometrical science of Kinematics that any motion whatever of a rigid body can be reduced to *three* displacements in any three rectangular directions, together with *three* rotations about any three rectangular axes—so that the equilibrium of a rigid body is secured if no work be done on the whole in any of these *six* displacements. There are thus six conditions of equilibrium for a rigid body under the action of any forces—and these are reduced to *three* (two displacements and one rotation), if the forces are confined to one plane; and to *one* (a displacement), if the forces act all in one line.

Equilibrium may be *stable*, *unstable*, or *neutral*. It is said to be stable, if the body, when slightly displaced in any way from its position of equilibrium, and left free, tends to *return* to that position. It is unstable, if there is any displacement possible, which will leave the body in a position in which it tends to *fall further away* from its position of equilibrium. It is neutral, if the body, when displaced, is still in equilibrium. It is easily shewn, but we cannot spare space for the proof, that a position of stable equilibrium is, in general, that in which the Potential Energy (see FORCE) of the body is a minimum—of unstable equilibrium, where it is a maximum (for some one direction of displacement at least)—of neutral equilibrium, where the potential energy remains unchanged by any small displacement. Thus, a perfect sphere, of uniform material, is in neutral equilibrium on a horizontal plane—while an oblate spheroid, with its axis of rotation vertical, is in stable equilibrium; and a prolate spheroid, with its axis vertical, is in unstable equilibrium on the plane. Similar statements hold for other than rigid bodies. Thus, a chain, or a mass of fluid, is in stable equilibrium when its potential energy is least, i. e., when its centre of gravity is as low as possible. This simple statement is sufficient for the mathematical solution of either question.

STA'TIONERY, a very general term applied to the materials connected with writing, such as paper, books for accounts, drawing, &c., envelopes, sealing materials; and even writing-desks, blotting-books, albums, porte-feuilles, pocket-books, red tape, and many other necessaries of the writing-desk, are included.

STATIONERY OFFICE, an office in London established by the Lords of the Treasury in 1786, for the purpose of purchasing, wholesale, writing materials for the supply of the government offices at home and abroad. It also contracts for the printing of all Reports and other matters laid before the House of Commons. The duties are performed by a comptroller, a storekeeper, and about thirty clerks or other subordinate officers. There is a branch establishment in Dublin. The appointments are made by the Lords of the Treasury.

STATIONS (Lat. *statio*), a name applied in the Roman Catholic Church to certain places reputed of special sanctity, which are appointed to be visited as places of prayer. The name is particularly applied in this sense to certain churches in the city of Rome, which, from an early period, have been appointed as churches which the faithful are particularly invited to visit on stated days. The names of these churches are found on the several days in the Roman missal prefixed to the liturgy peculiar to the day. The word, however, is employed in a still more remarkable manner in reference to a very popular and widely-received devotional practice of the Roman Catholic Church, known as that of 'The Stations of the Cross.' This devotion prevails in all Catholic countries; and the traveller often recognises it even at a distance by the emblems which are employed in directing its observance—the lofty 'Calvary' crowning some distant eminence, with a series of fresco-pictures or bas-reliefs arranged at intervals along the line of approach. These representations, the subjects of which are supplied by scenes from the several stages of the Passion of our Lord, are called Stations of the Cross, and the whole series is popularly known as the *Via Calvaria*, or Way of Calvary. The origin of this devotional exercise, like that of local pilgrimages, is traceable to the difficulty of access to the Holy Places of Palestine, consequent on the Turkish occupation of Jerusalem and the Holy Land; these representations being designed to serve as some analogous incentive to the piety and faith of the Christian worshipper of our Lord in his Passion. The number of the so-called 'stations' is commonly 14, although in some places 15, and in others, as Vienna, only 11; but whatever may be their number, the subject of all is a sort of pictorial narrative of the Passion. The devotional exercise itself is performed by kneeling at the several stations in succession, and reciting certain prayers at each. Forms of prayer are prescribed to those who can read. The poor and ignorant recite the Lord's Prayer and Hail, Mary! all being directed to fix their thoughts in grateful memory upon 'the sufferings which each representation describes our Lord as having undergone, in atonement for the sins of mankind.' Many 'indulgences' are granted to those who, having duly repented of their sins, shall piously perform this exercise. Many of these stations are celebrated as works of art, especially one near Bologna. Some of those in the Alps and along the precipitous banks of the Rhine, Danube, and other German rivers, are exceedingly striking and picturesque.

STATI'STICS, that branch of Political Science which has for its object the collecting and arranging of facts bearing on the condition, social, moral, and material, of a people. The word statistics was first employed in the middle of last century by Professor Achenwall of Göttingen, who may be considered the founder of the science. The principle lying at its foundation is, that the laws which govern nature, and more especially those which govern the moral and physical condition of mankind, are constant, and are to be discovered by the investigation and comparison of phenomena extending over a very large number of instances. Accidental diversities tend to neutralise each other, their influence diminishing as the area of investigation increases; and if that area be sufficiently extended, they so nearly disappear, that we are entitled to disregard them altogether. While the length of a single life cannot be counted on, an average of 1000 or 10,000 lives gives us a constant quantity, sufficiently near the truth to answer the purposes of insurance companies. Even the acts which are the most purely voluntary as regards individual men, have been found to be subject to laws which, in respect of the masses which make up society, are invariable in like circumstances, and discoverable.

The science of statistics has a twofold relation to political and social economy. The facts collected by the statist are the bases on which political economy rests; their application to social and economical problems is an appeal from imagination to fact. But the statist must be guided by the political economist in what direction to extend his investigations: without political economy, we should have had no statistics.

It would be difficult to give any exhaustive enumeration of the multifarious topics which may be the subject of statistical inquiries. The results of statistics have been classified as—1. Problems regarding the nature of wealth and its production and growth in a community; 2. Problems relating to inland and foreign trade; 3. Problems relating to taxation and finance; 4. Problems regarding currency, banks, and prices; 5. Problems relating to the wages and hire of labour, and the division of employments; and 6. Problems relating to the functions of the state as regards interference with the economic relations of its subjects.

The Statistical section added to the British Association for the Advancement of Science in 1833, and the London Statistical Society founded in 1834, have made some valuable contributions to this science, and helped to diffuse a knowledge of its principles and its importance. But while in some branches there is undoubtedly room for the labours of individuals or associations, statistics are, generally speaking, more appropriately the province of the state. The most important of the subjects with which this science is cognizant, cannot be investigated without unrestricted access to government offices, and authority to demand information; and the ordinary administration of government is continually affording opportunities for the collection of the most valuable statistical facts. For some time past, statistics have largely occupied the attention of the more enlightened governments of Europe. The statistical reports issued by the various departments of the French government deserve especial praise for the comprehensiveness of their basis, and the clearness of their arrangement. The government of Belgium has, since 1841, engaged with much diligence in statistics, and Austria and Prussia have also their Statistical departments. In the United Kingdom, a department of the Board of Trade has, since 1832, been charged with collecting and publishing detailed and classified information obtained from various departments of government regarding the revenues, population, commerce, wealth, and moral and economical condition of the country and colonies, as well as a selection from the statistics of foreign countries. Every session of parliament, there are also numerous statistical returns called for, which no doubt sometimes contain valuable material, but being drawn up to suit the particular purpose of those who move for them they have too often a desultory, fragmentary character, and from the absence of any general plan, are of little use but for the moment. It has been suggested that, by establishing a separate Statistical department of government, we might, at a hardly greater cost, obtain a yearly *résumé* of administrative statistics complete enough to supersede, to a large extent, the present system of moving for returns whenever they are wanted.

The frequent connection of statistics with political theories renders it important to guard against premature statistical conclusions, of which two very fertile sources are calculations from an insufficient number of data, and neglect to make allowance for disturbing causes.

STA'TUARY AND STATUE. See SCULPTURE.

STA'TUTE OF FRAUDS, in English Law, is a statute which required certain contracts and agreements to be in writing, in order to be binding in such cases. The object of the statute, 29 Char. II. c. 3, was to prevent the perjury which so frequently takes place where the proof of the contract is left to the memory of the parties. All leases for more than three years, and their assignments, must be in writing; and no freehold estate in lands can be created except by writing. So promises and agreements to bind an executor or administrator personally must be in writing; as well as to bind one party for the debt of another. So as to contracts made for the sale of land, or of interests in land; and for the sale of goods above £10 in price, unless part of the goods have been accepted and received, or partly paid for.

STATUTE OF LIMITATIONS. See LIMITATION.

STATUTES OF DISTRIBUTIONS. See DISTRIBUTIONS.

STATUTES, or ACTS OF PARLIAMENT, are those laws made from time to time by the legislature, which qualify and alter the common law or previous statutes. All laws may be divided into common law and statutory law, the former being unwritten, the latter being written. The theory as to the common law is, that it consists merely of ancient statutes, worn out by time, of which the written exposition has perished, but which tradition has kept alive; and much of the common law necessarily consists of what has sometimes been called judge-made law — a department of law which has often been ignorantly denounced as illegal or unconstitutional, but which is a necessary part of every code, under whatever name it is disguised. The legislature of Great Britain consists of the Queen, Lords, and Commons, in parliament assembled, and the statutes which they pass have been likened by Sir Matthew Hale to written contracts or indentures, the general public being bound, by their respective agents, as if by solemn deed. There is no legal mode of altering the previously existing law, except by a statute passed with the consent of parliament; but there are other ways of modifying the law, so far as mere details of administration are concerned —as, for example, by orders in council, by ordinances by charters, and by by-laws issued under some

inherent or statutory power belonging to corporations. The mode in which a statute is made belongs properly to the head of Procedure in Parliament. Statutes or acts of parliament are all founded on the theory that the legislature has an inherent right to alter all previous laws or statutes; and though sometimes great and leading statutes have been declared to be unalterable by any future parliament, this restriction is obviously utterly futile, and inconsistent with the idea of a legislature. Statutes are usually divided, according to the number of persons affected by them, into public and private—the former applying to the whole public, the latter only to the persons named or described. There is also a subdivision of both into local and personal statutes. Statutes are also divided into declaratory, penal, or remedial, according to the nature of their object. There are certain important rules as to the interpretation of statutes, the chief business of the various courts of law and equity being to construe or interpret the statutes. A statute begins to operate from the time when it receives the royal assent, unless it state some other time for its commencement; but formerly each statute was presumed to take effect from the beginning of the session of parliament in which it passed, until the rule was changed, in 1793, by the act 33 Geo. III. c. 13. The leading rule in construing statutes is, that the words are to be taken in their ordinary grammatical sense, unless the context shews that they are used in some other sense. All other rules resolve more or less into this. There is also a well-known rule that penal statutes are to be construed less strictly than other statutes of a remedial kind. Another rule is, that a subsequent statute repeals one that is prior, either expressly or by necessary implication, if the prior one is inconsistent in substance. Though it might seem an easy task to construe or interpret what is meant by a statute, it is in practice so far from being easy, that it requires a special training and long experience to arrive at an accurate mode of construction, the chief business of lawyers being to acquire this art; and one excels another solely or chiefly by virtue of the tact, skill, and accuracy of thinking which are required to do such work in perfection. All the main disputes in litigation turn chiefly on the different interpretations put by parties on statutes or contracts, both of which are construed according to precisely the same rules. Another rule applicable to statutes is, that each remains in force until it is repealed, either expressly or impliedly. So much confusion, however, has arisen out of the multiplicity of statutes, and it is so difficult for lawyers to discover what statutes have been so impliedly repealed, that, of late years, a process of revision and examination has been instituted by the government with a view to repeal expressly all that is obsolete and that is already only impliedly repealed, so as to reduce the bulk of the statutes, which have now grown to an inconvenient size. This task is preliminary to a codification of those statutes which remain after such revision and expurgation.

STAUBBACH, FALL OF, a celebrated waterfall in the southern part of the canton of Bern, Switzerland, a mile from the village of Lauterbrunnen, and 8 miles south of Interlachen. It is one of the loftiest in Europe, having a descent of between 800 and 900 feet, but it often disappoints visitors, who expect a swift loud-roaring cataract, and find instead a slender stream of water, concealing the face of the precipice like a 'beautiful lace veil, and imitating in its centre the folds of the drapery.' Long before it reaches the bottom, it is blown into a dust of silver spray, whence its name *Staubbach* (Dust-stream). Both Byron and Wordsworth have praised it in verse.

STAU'NTON, a town, capital of Augusta co., Virginia, on the Chesapeake and Ohio Railroad, and on a branch of the Shenandoah River, 120 miles west-north-west of Richmond; is the site of the Western State Lunatic Asylum and of Deaf and Dumb and Blind Asylums. It contains 10 churches, 2 newspapers, 4 academies and seminaries, mills, foundries, and manufactories. Pop. (1870) 5120; (1880) 6664.

STAVANGER. See SUPPLEMENT in Vol. X.

STA'VESACRE. See LARKSPUR.

STAVRO'POL, a government in the south-east of Russia, bounded on the N. by the government of Astrakhan, and by the country of the Don Cossacks; by the Caspian Sea on the E.; and by the Caucasus on the S. Area, 28,800 sq. m.; pop. (1865) 359,172. The chief rivers are the Kuban and Terek, forming the greater part of the southern boundary, and the Kuma. Along the shores of the Caspian, there are no harbours, and only fishermen's boats can approach the beach. The climate is milder in the east than in the west. In the south-west, where the soil is fertile, and produces millet and wheat, agriculture is the chief employment; in the north-east, the inhabitants lead a nomad life. Vineyards line the banks of the Terek and Kuma, and mulberry trees are cultivated for the rearing of silk-worms. Immense herds of oxen and sheep are sent to the interior of Russia.

STAVROPOL, capital of the government, stands on the chief highway from Europe to the Caucasus, 200 miles south-east of Rostov. It was founded in the end of the last century, and as yet it is only important from its position. Pop 5261.

STAY, STAYSAIL. See RIGGING, SAIL.

STEALING. See LARCENY.

STEAM. Steam is water in the gaseous form (see HEAT). When dry, it is invisible and transparent, like air, and is not to be confounded with *vapour*, which is steam returned to the state of water, and thus become visible — water-dust, as it were. As steam has become the most important of all motive powers, the properties on which its action depends deserve careful consideration. If we suppose the piston, *pp* (fig. 1), to have been close at the bottom of the cylinder, and then drawn up to its present position, the space *a* below it is a vacuum, and the piston has to be held up against the whole pressure of the atmosphere, which is equal to 15 lbs. on the square inch. If, now, a little water could be introduced into the bottom of the cylinder, without admitting any air, a quantity of vapour would rise from it, and press with more or less force on the lower side of the piston, so as to sustain a portion of the weight of the atmosphere. How much vapour would rise, and how much elastic force or pressure it would exert, would depend upon the temperature of the water and cylinder.

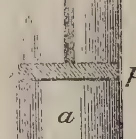


Fig. 1.

It is found that the vapour that rises at a low temperature has little elastic force. At 32°, the vapour in the space *a* would only sustain ·2 inch of mercury (see BAROMETER), corresponding to a pressure of $\frac{1}{10}$th of a pound on the square inch; if the apparatus were heated to 80°, more vapour would rise, until the tension or force would sustain 1 inch of mercury, shewing a pressure of ½ lb. on the square

inch. This would relieve part of the pressure of the external air on the piston, just as a portion of rarefied air would do. But there is this difference between vapour and air: if the space *a* were occupied by rarefied air, by lowering the piston, and compressing it into less space, its elastic force would increase, until it became equal to that of the external air, or greater. Not so with vapour; for if the piston were made to descend on it, instead of being compressed and made stronger, a portion of it would be condensed into water, and what remained would have the same force as before. This is on the supposition that the temperature remains the same; by raising the temperature of vapour sufficiently, it may be made to sustain any amount of compression, and acquire any degree of force.

The force of the vapour in *a* increases rapidly, as more and more heat is applied. At 100°, its pressure is equal to 1·86 inch of mercury; at 180°, it is 15 inches, or half the pressure of the atmosphere; so that if the piston is sustained by a hand, the hand will now feel itself relieved of half its load. When at last the heat comes to 212°, the pressure of the vapour is 30 inches of mercury, or 15 lbs. on the square inch, and at this point the piston would be sustained without a hand, the pressures on its two sides being equal.

It is at 212° that water in an open vessel begins to boil; that is, the vapour rises rapidly and in volumes, being able to displace the atmosphere (see BOILING). In this state, it is usually called *steam;* but there is no essential difference between steam at 212° and steam at 60°. The steam rising from boiling water in an open vessel is of the same temperature as the water—viz., 212°; but while passing into steam, it is found to absorb a great quantity of heat which does not affect the thermometer, and is therefore called *latent* heat (see HEAT).

When a cubic inch of water is converted into steam at the ordinary pressure of the atmosphere, its volume is increased to 1600 or 1700 cubic inches—that is, a cubic inch of water becomes nearly a cubic foot of steam. If produced under a pressure of two atmospheres, the steam of an inch of water will occupy only half the space, and so of other pressures.

When water is boiled in an open vessel, neither the temperature of the water, nor that of the steam rising from it, ever rises higher than 212°, however hot the fire; the heat as it enters is carried off in a latent state in the steam. But under pressure, the temperature of both can be raised to any degree. If, when the water and steam in *a*, fig. 1, came to 212°, the application of heat were still continued, more steam would continue to rise, and the pressure on the under side of the piston being now greater than that of the air above it, the piston would begin to ascend; but, suppose it held in the same position by force, the upward pressure of the steam would be found rapidly to increase, until it would soon require a weight of 15 lbs. on the square inch to keep it down; shewing that the elastic force of the steam was now equal to twice that of the atmosphere, or to 30 lbs. on the square inch. If at this point the temperature of the water and steam were examined, it would be found to be 250°.

Fig. 2 represents an apparatus which shews the elastic force of steam raised at higher temperatures than 212°. A strong copper sphere has in the bottom of it a quantity of mercury *m*, and above that a quantity of water *w*. A strong glass tube, open at both ends, passes air-tight into the sphere, with its lower end dipping into the mercury, and has a scale of inches EF, attached outside. T is a thermometer, with its bulb inside the sphere; and *b* is a tube opening into the sphere, with a stop-cock that may be opened and shut at pleasure.

The stop-cock *b* being open, let heat be applied to the bottom of the vessel until the water boils. The rising steam will soon expel the air, and occupy its place, being equal to it in elastic force. Before the application of heat, the mercury within the tube *t* does not rise above the level of the rest at *o*, for the tube differs from a common barometer in being

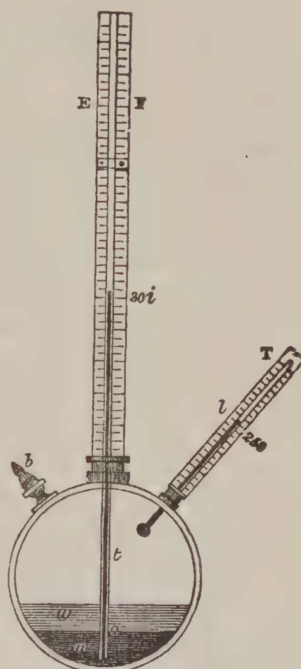


Fig. 2.

open at top; nor does it rise even when the water boils, for while *b* is open, the steam has no more pressure on the surfaces of the water and mercury than the air had. But if *b* is now shut, the pressure on the surface of the mercury within the sphere increases, and the mercury within the tube begins to rise and appear without the vessel. When it has risen to the point marked 30 inches on the scale (counted from *o*, the level of the surface within the vessel), it shews that the elasticity of the steam is able to sustain a column of mercury of 30 inches over and above the pressure of the atmosphere, which is resting on the top of that column, and is equal to another column of 30 inches. Its force is therefore equal to 60 inches of mercury, or 30 lbs. on the square inch; which is shortly expressed by saying, that it has a pressure of two atmospheres. A further rise of 30 inches in the tube would indicate an additional pressure of 15 lbs., or of three atmospheres in all.

Along with the mercury in the barometer tube, the thermometer also rises, but by no means at an equal rate. When the water boils, it has mounted to 212°, and it continues steadily at that point so long as the tube *b* is open; but on shutting *b*, it immediately begins to rise; and when the barometer tube is at 30 inches, the thermometer is found at about 250°. An addition of 38° of heat has thus doubled the elastic force of the steam. Another addition of 38° to the temperature would not simply

add another atmosphere to the pressure, but a great deal more; as will be seen from the following table:

Temperature, Fahrenheit.	Pressure in Atmospheres	Pressure in Pounds on the Square Inch.
212°	1	15
250°	2	30
275°	3	45
290°	4	60
372°	12	180
432°	20	300

The extreme danger of continuing to apply heat to a vessel while the steam is not allowed to escape, is thus evident; the bursting force soon becomes such as no vessel can resist.

Steam, like air and other gases, follows what is known as 'the law of Mariotte' (q. v.); its elastic force is always inversely as the space into which it is compressed. If the steam-space in the vessel fig. 2 is a cubic foot, it contains, at 212°, the steam of a cubic inch of water; when the temperature comes to 250°, another cubic inch of water has risen in steam, and has thus compressed the former quantity into one-half the space, but at the same time made its elastic force twice as great. If a cubic foot of this compressed steam is allowed to escape into a vessel of two cubic feet, its elastic force immediately falls from two to one atmosphere.

It is necessary here to bear in mind what was explained above with regard to vapour at low temperatures; viz., that steam cannot exist at a certain tension or pressure, if it is below a certain temperature. If a vessel were filled with steam from the apparatus fig. 2 while at the temperature 250°, and pressure of 30 lbs. to the square inch; as it cooled, portions of it would be condensed into water, and the pressure would diminish, until, at 212° of temperature, the pressure would be only 15 lbs. This fact in the constitution of steam causes a considerable loss of steam-power, through the cooling of the pipes and cylinders of engines.

Another fact regarding the constitution of steam deserves attention, from its importance in point of economy. We should naturally expect that it would take more heat or fuel to convert a pound of water into steam at 250° or 290° than at 212°; in reality, however, the difference is very slight; and the circumstance is thus explained. Steam rising from water at a low temperature, absorbs more latent heat than it does at a higher temperature. Thus, steam rising at 212°, absorbs about 1000° of latent heat; at 312°, it absorbs only 900°. Now, supposing the water put into the boiler at 60°, in the former case, 152° of heat have to be supplied to it to make the water boil, and then 1000° in the shape of latent heat—sum 1152°; in the latter, 252° are supplied to bring the water to boiling, and 900° to convert it into steam—sum, as before, 1152°. The expenditure of fuel is thus the same in both. Careful experiments have shewn that the sum of the latent and sensible heats is somewhat greater at the higher temperatures; but for practical purposes the law may be held true as above stated.

STEAM-CARRIAGE. Very early in the history of steam-locomotion, projects were formed for running steam-carriages on common roads—not to draw a train of vehicles after them, but each carriage to have passenger-accommodation as well as steam-power. Robison suggested such a thing to Watt so far back as 1759. A French inventor, Cugnot, tried a steam-carriage at Paris in 1770, which went with so much force as to dash down a brick wall, and thereby deter other inventors. In 1782, Murdoch exhibited a model of a steam-carriage; in 1784, Watt described his plans for another; and in 1786, Symington produced a model of a third. In the last-named year, too, Oliver Evans announced certain projects of the kind in the United States. In 1802, Messrs Trevethick and Vivian patented a steam-carriage, planned on a much better principle, than any that had preceded it; they adopted high-pressure steam, of which previous inventors had been afraid. The carriage was tried, but the ingenious patentees received very little encouragement, and soon turned their attention to railway matters. A long interval then passed without any new inventions in this kind of road-locomotion. When Telford and other engineers had improved the roads and highways, inventors were again induced to apply steam-power as a substitute for horse-power to road-vehicles. Bramah made a steam-carriage, in 1821, on a plan patented by Julius Griffiths. Gordon invented one in 1822, which worked something like a squirrel in a cage, the engine being within a cylinder which rolled along the ground; and another in 1824, which appeared to walk upon six iron legs. Goldsworthy, Gurney, Burstall, Hill, James, Hancock, Summers, Ogle, Heaton, Church, Dance, Field, Squire, Maceroni, Scott Russell, Hills, Sir James Anderson—all invented new forms of steam-carriage between 1824 and 1841. Some of these displayed great ingenuity, and attained a speed of 10 or 12 miles an hour on common turnpike roads. Sir Charles Dance ran such a carriage between Gloucester and Cheltenham in 1831, doing the 9 miles in 55 minutes; but the opposition of local interests put him down, after he had made 400 such trips without an accident, and carried a very large number of passengers. In the same year, Mr Hancock began running his steam-carriage, called *The Infant*, regularly between London and Stratford; and some time afterwards, Mr Scott Russell ran *his* invention between Glasgow and Paisley. All these three were passenger-vehicles which plied for traffic on the road. In the very numerous inventions from time to time brought forward, the passengers were in some cases seated in front of the engine and boiler; in others, they were seated behind; in others, the tank for water was placed beneath the passengers' feet; while in a fourth kind there was a passenger-carriage, distinct from, but linked to, the steam-locomotive. None of the inventions, however, attained to commercial success, so many were the difficulties which beset them.

The last quarter of a century has exhibited inventions rather for heavy traction than for passenger steam-carriages. One of the most remarkable of the latter kind is that which the Earl of Caithness drove, in 1864, from Inverness to his seat near Thurso. It carried three or four persons, and ascended and descended very steep inclines without much variation of speed. As a question of profit or commercial advantage, the inventors of such engines now look to their employment on common roads, for dragging ponderous weights which would otherwise require a long team of horses. Numerous patents have been taken out with this view, by Boydell, Bray, Clayton, Burrell, Giles, Stirling, Aveling, Cresswell, and other inventors, for carriages of strong construction, and generally with broad wheels. In one invention, the wheels cog themselves in a very ingenious way, to enable them to grip the ground in ascending gradients; in another, the wheels carry a sort of plank railway with them, to lay down as they roll over soft marshy ground. Some of these heavy traction-engines have been employed in drawing ponderous masses in the dockyards, in the yards of great engineering establishments, and in the roads and streets of the metropolis; while many have been sent out to Asia and South America, to draw heavy loads in regions where roads are scarce and defective, or where steep ascents would tax the strength of

draught-animals, or where ordinary narrow-wheel vehicles would sink into soft ground.

Acts of parliament were passed in 1861 and 1865 to regulate the use of locomotives on common roads. The width, the weight, the speed, the number of attendants, the toll, the consumption of smoke, the lights, the signals, the hours—are all so determined by clauses in these acts (especially the second) as to discourage rather than encourage enterprises of this kind. This restrictive legislation had its cause in the fear that accidents would otherwise be prevalent. See also STEAM-C. in SUPP. in Vol. X.

STEAM-CRANE. See SUPPLEMENT in Vol. X.

STEAM-ENGINE. By a steam-engine is now generally understood an engine in which the elasticity or expansive force of steam is used as the moving-power; just as the weight or impulse of water is in the water-wheel, or the pressure of the wind in a windmill. In some of the earlier engines of this kind, it was really the pressure of the atmosphere that was the motive-power, steam being employed merely as a means of producing a vacuum through its rapid condensation, and thus allowing the pressure of the atmosphere to come into play. As a source of power, steam has many advantages over wind and water. It is independent of the weather, may be applied anywhere, affords a constant equable motion, and is capable of indefinite increase. Its invention, therefore, has caused a new era in the arts; and the revolution which it has brought about in industry of all kinds, as well as the influence it has had on civilisation in general, and must yet have in a higher degree, are altogether incalculable.

The invention of steam as a moving-power is claimed by various nations; but the first extensive employment of it, and most of the improvements made upon the steam-engine, the world indisputably owes to the English and the Americans. It would appear that as early as 1543, a Spanish captain, named Blasco de Garay, shewed in the harbour of Barcelona a steamboat of his own invention. It is most likely that Blasco's engine was on the principle of the Æolipile of Hero, invented 130 B.C., in which steam produces rotatory motion by issuing from orifices, as water does in Barker's Mill (q. v.). The preacher Mathesius, in his sermon to miners (Nuremberg, 1562), prays for a man who 'raises water by fire and air,' shewing the early application of steam-power in Germany; and the German engineer, Sol. de Caus, in the service of the Elector Palatine in Heidelberg, describes, in his work, *Les Raisons des Forces Mouvantes avec Diverses Machines* (Frankf. 1615), a steam-machine, which was merely a contrivance for forcing the water contained in a copper ball through a tube by applying heat. The Italian engineer, G. Branca, invented, in 1629, a sort of steam windmill; the steam being generated in a boiler, was directed by a spout against the flat vanes of a wheel, which was thus set in motion.

In England, among the first notices we have of the idea of employing steam as a propelling force, is that contained in a small volume,* published in 1647, entitled *The Art of Gunnery*, by Nat. Nye, mathematician; in which he proposes to 'charge a piece of ordnance without gunpowder,' by putting water instead of powder, ramming down an air-tight plug of wood, and then the shot, and applying a fire to the breech 'till it burst out suddenly.' But the first successful effort was that of the Marquis of Worcester. In his *Century of Inventions*, the manuscript of which dates from 1655, he describes a steam-apparatus by which he raised a column of water to the height of 40 feet. This, with the exception of Blasco's, was the first really useful application of steam; the others had been mere toys. Sir Samuel Morland, in 1683, submitted to Louis XIV. a project for raising water by means of steam, accompanying it with ingenious calculations and tables. The first patent for the application of steam-power to various kinds of machines was taken out in 1698 by Captain Savery. In 1699, he exhibited before the Royal Society a working model of his invention. Savery, in pumping mines, made use of the condensation of steam in a close vessel to produce a vacuum, and thus raise the water to a certain height, after which the elasticity of steam pressing upon its surface was made to raise it still further in a second vessel. Papin, who had been made acquainted, through Leibnitz, with the attempts of Savery, but who must be allowed at the same time the honour of an original inventor, gave, in 1707, a complete theory of the steam-engine, together with a drawing of an engine of his own construction, having as early as 1688 and 1690 published precursory ideas on the subject. Some attribute to Papin the origin of the idea of the cylinder and piston; but this is denied by others. Thomas Newcomen, a blacksmith, carried out the principle of the piston in his Atmospheric Engine, for which he took out a patent in 1705. This was the first engine that was made practically and extensively useful, and forms the transition to the present steam-engine. It was chiefly used for

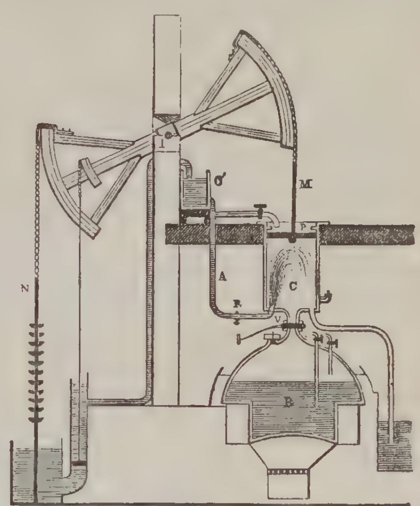


Fig. 1.

working pumps. To one end of a beam moving on an axis I, was attached the rod N, of the pump to be worked; to the other, the rod M, of a piston P, moving in a cylinder C, below. The cylinder was placed over a boiler B, and was connected with it by a pipe provided with a stop-cock V, to cut off or admit the steam. Suppose the pump-rod depressed, and the piston raised to the top of the cylinder—which was effected by weights suspended at the pump-end of the beam—the steam-cock was then turned to cut off the steam, and a dash of cold water was thrown into the cylinder by turning a cock R, on a water-pipe A, connected with a cistern C′. This condensed the steam in the cylinder, and caused a vacuum below the piston, which was then forced down by the pressure of the atmosphere, bringing with it the end of the beam to which it was attached, and raising the other along with the

* The volume is in the possession of Mr S. Holliday, to whom we are indebted for this fact.

pump-rod. The cock was then turned to admit fresh steam below the piston, which was raised by the counterpoise; and thus the motion began anew. The opening and shutting of the cocks was at first performed by an attendant, but subsequently by levers acted on by pins in a rod suspended from the beam, so that the machine became self-acting. Newcomen's was thus really an atmospheric engine, in accordance with its name. Engines of this description were found in practice to raise 7 or 8 lbs. for every square inch of piston.

The next essential improvements on the steam-engine were those of Watt, which began a new era in the history of steam-power. The first and most important improvement made by Watt was the separate condenser, patented in 1769. He had observed that the jet of cold water thrown into the cylinder to condense the steam, necessarily reduced the temperature of the cylinder so much that a great deal of the steam flowing in at each upward stroke of the piston was condensed before the cylinder got back the heat abstracted from it by the spurt of cold water used for condensing the steam in the cylinder. The loss of steam arising from this was so great, that only about one-fourth of what was admitted into the cylinder was actually available as motive-power. Watt therefore provided a separate vessel in which to condense the steam, and which could be kept constantly in a state of vacuum without the loss which arose when the cylinder itself was used as a condenser. This device, which now looks simple enough, was the greatest of Watt's inventions, and forms the foundation of his great fame. He made many other improvements in the details of steam-engines, the most beautiful of which is the *parallel motion;* and in conjunction with his partner, Boulton, he so improved the quality of the workmanship employed in constructing steam-engines, that he was able to introduce the double-acting engine, in which the cylinder is closed at both top and bottom: the piston is connected to the beam by a piston-rod, which passes through a *stuffing-box.* In this form of engine, steam was admitted by suitable valves, worked by the engine itself, alternately at the top and bottom of the cylinder, pushing the piston up and down with a force in proportion to the pressure of the steam; and at the same time a communication was regularly opened by valves between the cylinder and separate condensing vessel, so that the steam, after having pushed the piston from one end of the cylinder to the other, suddenly rushed into the condensing vessel, where it met and mingled with a stream of cold water, and was instantly condensed, thus leaving in the cylinder a vacuum as perfect as in the condensing vessel itself, and that without cooling the cylinder to any important extent. This form of engine, introduced by Boulton and Watt in 1769—1785, is essentially the same as the condensing engine now in general use.

It would be inconsistent with our limits to enter into the constructive details of steam-engines; we can only afford to give a general notion of the way in which the motion is originated, and to explain the chief principles on which the motive-power and economy of engines depend. Steam-engines are of two kinds, *condensing* and *non-condensing.* The non-condensing engine being the more simple of the two, may be first considered.

The Non-condensing Engine.—If steam with a tension of two atmospheres is admitted above a piston, and a communication is opened between the steam below it and the atmosphere, the pressure on the two sides of the piston will differ by an atmosphere, the piston will descend, and the steam will rush out into the atmosphere with the same force that the atmosphere rushes into a vacuum. In other words, the atmosphere is a vacuum to high-pressure steam, and enables the condenser to be dispensed with. Hence the name of Non-condensing Engine. Non-condensing engines alone are used in

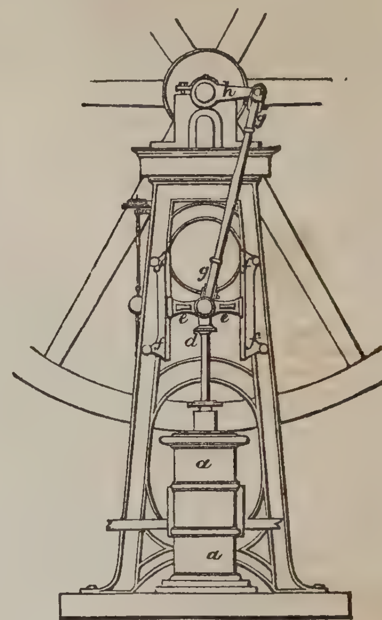


Fig. 2.

locomotives, and wherever economy of space is important. Fig. 2 represents a front view of the form known as the *crank-overhead* engine; fig. 3 is a section of the cylinder and valve-chest. The *cylinder, aa,* is made of cast-iron, and bored in a lathe; the *piston, vv,* is made to ply up and down in it, air or steam tight; and the *piston-rod, d,* passes through a hole in the cylinder cover and a *stuffing-box* above it, in which it is surrounded by packing of hemp and tallow, so as to prevent the escape of steam. From near the top and bottom of the cylinder proceed two passages, which open outwards near each other into a cavity *bb,* called the valve-chest. Between the two openings or

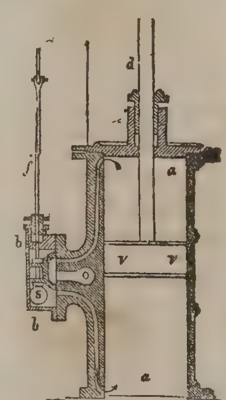


Fig. 3.

steam-ports that lead to the interior of the cylinder, there is another opening or port *o,* which does not enter the cylinder, but leads to the exhaust-pipe, by which the steam escapes when it has done its work. The surface or facing where these three ports open is made smooth, so that the valve, which is a hollow metal plate, may slide upon it steam-tight. Fig. 4 shews the three steam-ports, on a larger scale, with the valve *a* in two positions; in the one, it connects the upper duct *cc* with the exhaust-pipe *b*; in the

other, the lower duct d' is connected with b'. The cavity behind the valve in the valve-chest bb, fig. 3, is always filled with steam, which enters from the boiler by the steam-pipe s.

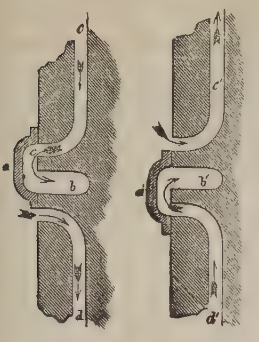


Fig. 4.

When the valve covers the upper port, the lower is left open to the steam-chest, so that steam rushes into the cylinder below the piston, and presses it up, while the steam which is above the piston escapes by the exhaust b (or o in fig. 3). By the time the piston has reached the top, the valve has commenced its descent towards the position a', fig. 4, and the motion of the piston is reversed. The valve is made to slide up and down at the right time by the motion of the shaft through means of an eccentric and rod j. The alternating motion of the piston-rod d is converted into the rotatory motion of the shaft by means of the Crank (q. v.) h, and connecting-rod gg.

Another form of engine now in general use is the horizontal engine, represented in fig. 5. It differs in no respect in its action from that just described, but it is more cheaply made, and can be driven at a higher velocity in consequence of its more compact form, and more secure attachment to its foundations.

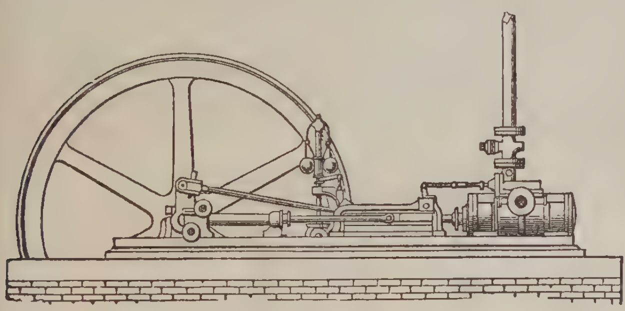


Fig. 5.

The amount of working-power in a steam-engine depends on the tension or pressure of the steam, the size of the piston, and the rate at which it travels. Suppose that the area of the piston vv, fig. 3, is 1000 square inches; that the pressure of the steam entering the cylinder is 3 atmospheres, or 45 lbs. on the square inch; that the length of a *stroke*, that is, an ascent or a descent of the piston, is 5 feet; and that 20 strokes (10 up and 10 down, corresponding to 10 revolutions of the crank and shaft) are made in the minute. While the piston is ascending, the steam above it is open to the atmosphere through the waste-pipe, and therefore its pressure is equal to that of the atmosphere, or 15 lbs. to the inch; and the pressure below the piston being 45 lbs., it moves under a pressure equal to the difference, or 30 lbs. to the inch; which, for the whole surface, gives a force of 30,000 lbs. Now, a pressure of 30,000 lbs. over 5 feet, makes $30{,}000 \times 5$ or 150,000 units of work for one stroke; and $150{,}000 \times 20 = 3{,}000{,}000$ will be the work done in one minute. Dividing this by 33,000, the units of work in a horse-power, we get 90·9 (91 nearly) as the theoretical horse-power of such an engine.

The steam in the cylinder has always less pressure than that in the boiler, partly from being cooled, and partly from being obstructed by the comparative narrowness of the passages on its way. The pressure is also unequal at different parts of the stroke, owing to the opening and closing of the ports being only gradual. In calculations of work, then, a certain mean pressure has to be taken as the multiplier. In addition to this, allowance has to be made for losses by friction—the friction of the piston, of the piston-rod and its cross-head ee (fig. 2), of the connecting-rod gg, of the shaft in its bearings, of the eccentric and its rod j, of the feed-pump, &c. On an average, from $\frac{1}{4}$ to $\frac{1}{3}$ of the calculated power of an engine has to be deducted for these losses, in order to get the effective power.

Steam used Expansively.—A great saving of steam arises from working it expansively. Suppose that the steam enters below the piston, fig. 6, at a pressure of 4 atmospheres, or 60 lbs. to the square inch. Set off $ba = 4 \times 15 = 60$, to represent the amount of the pressure, and complete the parallelogram bf, f being the highest point to which the bottom of the piston reaches; af thus represents the length of a stroke, which we shall suppose to be 5 feet. Were there no pressure on the upper side, and did the pressure below continue uniformly 60 lbs. to the top, the work due to 1 square inch of the piston for each stroke of 5 feet, would be $60 \times 5 = 300$; and this may be represented by the rectangle $abef$, the area of which is found by multiplying ba by af. But the piston is resisted all the way by a force of 15 lbs. to the inch, or 1 atmosphere; and if ak is made $\frac{1}{4}$ of ab, the figure $akif$ will represent the deduction to be made on this account; so that the work really due to a square inch of the piston is represented by the rectangle $kbei$, or $45 \times 5 = 225$.

But instead of allowing the steam to flow into the cylinder during the whole time of the stroke, let it be cut off when the piston is at c, or one-half the stroke; the steam already in the cylinder will expand and follow the piston, still urging it on, although with a diminishing force. When the piston has reached the top, the steam will have expanded to twice its former bulk, and by the law of Mariotte (q. v.), its pressure will be reduced to half of what it was, or 2 atmospheres, which will be expressed by fl, taken equal $\frac{1}{2}$ fe, or

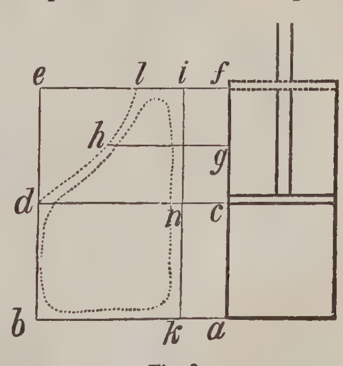


Fig. 6.

30. At any intermediate point, as g, the line gh representing the pressure is found by this proportion, $ga : ca :: cd$ (or ab) $: gh$; that is, the pressures are inversely as the spaces occupied by the steam. If, for example, $ga = 3\frac{3}{4}$ feet, and $ca = 2\frac{1}{2}$ feet, the proportion will be $3\frac{3}{4} : 2\frac{1}{2}$, or $15 : 10 :: 60 : 40 = gh$.

When a number of pressure lines or ordinates are thus found, a line *dhl* traced through their extremities forms a curve (part of a hyperbola); and the area of the figure *ndhli* will represent the work done on a square inch of the piston after the steam is cut off, still allowing for the resistance on the other side of the piston, which remains constant to the top. All this work is got without any additional expenditure of steam, and is thus clear gain.

The amount of the gain, in the case now supposed, may be thus calculated approximately. Find a number of ordinates, as gh was found, at points equally distant from one another, from c to f; from these find a mean pressure or ordinate, and multiply by cf, and the product will be the area of the figure *cdhlf* nearly. The more ordinates are taken, the result will be the nearer the truth. If we take the three ordinates, cd, gh, fl, the mean of which is 43, the result will not be very far from the truth; this gives for the area $43 \times 2\frac{1}{2} = 107{\cdot}5$. If to this is added the area of $abdc = 60 \times 2\frac{1}{2} = 150$, we get the area of the whole figure $abdlf = 257{\cdot}5$; and deducting the area of $akif = 5 \times 15 = 75$, for the resisting pressure above the piston, we have 182·5 as the work done on each square inch of the piston by the expansive stroke. Now, the work of a stroke at full pressure the whole way is 225; but the same quantity of steam that does one stroke at full pressure, will do two strokes expansively, or 365 shewing a gain of 140 units of work to the square inch of the piston, on one cylinderful of steam. The work done by the same quantity of fuel in the two methods is as 225 to 365, or 1 : 1·6.

The figure *kbdli* represents the theoretical work of a stroke; but owing to the causes mentioned before, and to other imperfections, such as leakage, the actual work is more accurately represented by the dotted figure within. By means of an ingenious apparatus called an *Indicator*, the steam in the cylinder is made to record its own state of tension. The piston of a small attached cylinder carries a pencil, and, as it protrudes more or less according to the pressure, traces on a revolving piece of paper a figure like the dotted one in fig. 6.

The higher the pressure of the steam, and the sooner it is cut off, the greater is the saving resulting from the expansive method. The steam is generally cut off much earlier than half-way—at $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, &c. of the stroke; and the economy is thus much greater than in the case we have supposed. At $\frac{1}{4}$, the economy is stated by writers on the steam-engine to be as much as 1 to 3. The limit to this process lies in the approach of the curve at l to i, when the moving pressure on the piston would be nothing.

The Condensing Engine.—Condensing engines are generally at the same time beam-engines, but not necessarily so. Condensing engines may be worked with steam at the pressure of the atmosphere, or even under; hence they were at one time called *low-pressure* engines, and the non-condensing kind, *high-pressure* engines; but condensing engines are now as often worked with steam at a pressure of several atmospheres, as at low pressure; so that the old designations have ceased to be distinctive.

Fig. 7 is a section of a condensing engine with a

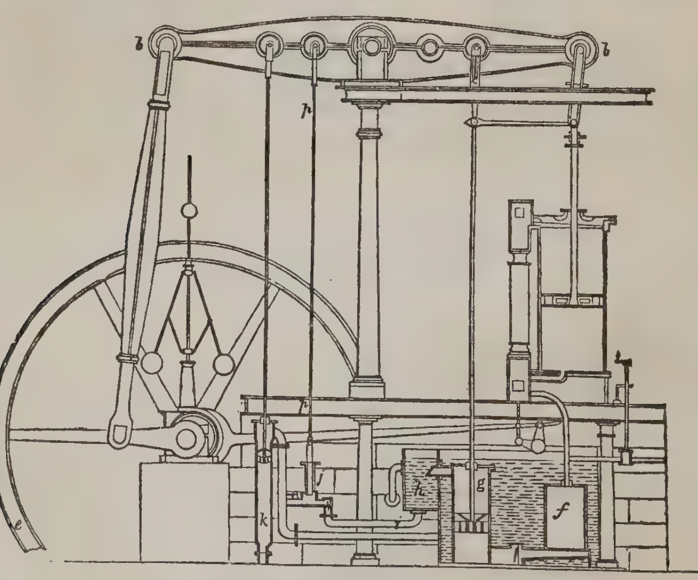


Fig. 7.

beam *ll*, the action of which has been explained above. The fundamental difference between the condensing and non-condensing engine is this: that in the former the steam, instead of escaping into the air, is conducted by the exhaust-pipe into a *condenser*, *f*. This is a vessel exhausted of air, and surrounded by cold water, so that when the steam rushes in, it is deprived of its latent heat, and turned to water. To make the process more rapid, a jet of cold water, which can be regulated by a handle, is injected in a shower through the vessel. This injected water and that of the condensed steam, together with any air that may enter with the water and steam, are pumped out by the air-pump g; the water is delivered, still hot, into the cistern h, from which it is sent to feed the boiler by the hot-water pump *jpp*

k is a cold-water pump for supplying the cistern surrounding the condenser.

The steam enters and leaves the cylinder in much the same way as in the non-condensing engine; but the amount of power developed is calculated somewhat differently. First, let us suppose that steam at the pressure of 1 atmosphere is entering below the piston; then, the upper port being in connection with the condenser, which is theoretically a perfect vacuum, there ought, if the instantaneous escape of the steam were not obstructed by the narrowness of the passage, to be a vacuum above the piston, so that it would move under a pressure of 1 atmosphere, or 15 lbs. to the square inch; but owing to the warmth of the water in the condenser, there must always be a portion of uncondensed vapour in the condenser, having a pressure of several pounds; and from this and other causes, the tension of the steam before the moving piston can seldom be less than 4 or 5 lbs. The real moving-force is thus reduced to perhaps 10 lbs., which, with a piston of 1000 inches in area, and a stroke of 5 feet, gives 50,000 as the work done on the piston in one stroke. Knowing the number of strokes in a minute, the horse-power of the engine may be calculated as before, allowance being made for losses by friction and other causes. In the condensing engine, the air-pump occasions an additional loss of about $\frac{1}{10}$th the total power.

In the beam-engine, the end of the beam to which the piston-rod has to communicate motion necessarily moves in an arc of a circle, while the rod itself must move in a straight line; and the mode of connecting them has always been a difficulty. For this purpose, Watt contrived his *Parallel Motion*, which consists of a system of rods or levers jointed together, so that one point may always move in a straight line.

The action of the *governor*, another of Watt's many inventions, will be understood from fig. 8. An upright spindle has two balls jointed to it, and revolving along with it, the spindle being set in motion by a pulley in connection with some shaft of

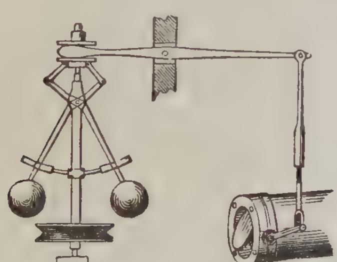


Fig. 8.

the machinery. At the ordinary velocity of the engine, the balls have a certain divergence, but when, as often happens, the resistance to the machinery becomes for a time less, and the speed consequently increases, the balls, having their centrifugal force increased, begin to diverge further. In doing so, the upper ends of the rods by which they hang pull down a boss that slides upon the spindle, and is clasped by the forked end of a lever. This lever is connected with a *throttle-valve*, or circular disc, in the tube that conveys the steam to the cylinder; and the depression of the end of the lever has the effect of closing more or less the passage for the steam, and thus diminishing the driving-force.—For the Boiler and Safety-valve, the reader is referred to these heads.

Engines without beams are called *direct-acting* engines. The piston-rod is made to preserve its parallelism by means of a cross-head *ee* (fig. 2), moving in guides *f*, *f*. A contrivance for rendering the action still more direct, and thus saving room, is

The Oscillating Engine (fig. 9), in which the piston-rod itself is made to turn the crank, and the cylinder is suspended on trunnions, so as to oscillate and accommodate itself to the motion of the crank. This form is chiefly used in marine engines.

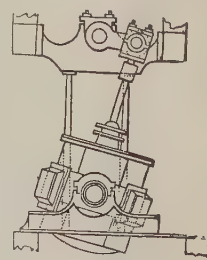


Fig. 9.

Rotary Engines.—As soon as the steam-engine came to be applied to drive machinery by turning a shaft, it was seen how desirable it would be to get rid of the alternating motion of the piston, and make the steam drive the piston round and round, carrying the shaft with it. The saving in expense of construction, in room, and in the loss of power by friction, by thus getting rid of beams and cranks altogether, is so obvious, that innumerable attempts have been made to carry the idea into practice, hitherto, however, with little success. The most promising attempt is the rotary steam-engine invented and patented in 1863 by R. W. Thomson, C.E., F.R.S.E., of Edinburgh. The engraving represents a wooden model made for the

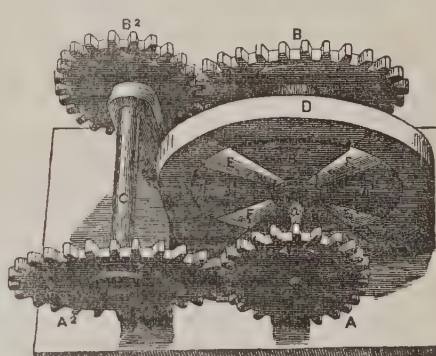


Fig. 10.

purpose of shewing the movements. There is a perplexing simplicity about this machine. It has neither slide-valve, connecting-rod, nor crank. In the cylinder, represented by D, revolve, independently, two steam-tight vanes, one of which, A^1A^1, is keyed on the axis *a*, which passes through one end of the cylinder, and has keyed on its outer end the elliptic teethed wheel A; the other vane B^1B^1 is precisely similar, with its axis passing through the other end of the cylinder, and having keyed on its outer end the elliptic wheel B. On the shaft, C, elliptic wheels A^2 and B^2 are keyed, with their long axes at right angles to each other. The wheels A and A^2 gear into each other, as also B into B^2. Steam is admitted through ports in the sides of the cylinder, at points indicated by the arrows 1 and 3, and escapes, after having done its work, through similar ports at 2 and 4. At first sight, it would seem as if steam acting in the angular spaces, E, E, would force B^1B^1 backwards as much as it forced A^1A^1 forwards. It will be seen that the latter acts on the shaft, C, with a mechanical *advantage*, arising from the short radius of A acting on the

long radius of A^2; while B acts on the same shaft, C, with a mechanical *disadvantage*, arising from its long axis acting through the short axis of B^1. The result of this combination is, that A^1A^1 will move faster and further than B^1B^1; it will overpower B^1B^1, which it will drag after it. The angular distance from 2 to 1 is 45° *less* than that from 1 to 4, and the ellipticity of the wheels is so arranged, that each vane will pass from 2 to 1 in the same time as the other vane passes from 1 to 4 (similar distances being traversed by the other ends of the respective vanes). Steam will continue flowing *into* the angular spaces, E, E, and *out* of the angular spaces, F, F, until the first have become 45° and the last have closed up, which events will coincide with the moment when A^1 has overtaken B^1, and also the whole of the vanes have arrived exactly opposite the ports, 1, 2, 3, and 4. Up to this point, B^1 has been acting as a steam stop or abutment to A^1; but now an interchange of functions takes place, A^1 becomes the slower moving vane and the *point d'appui* to enable B^1 to do its work. At first sight, it looks as if the power required to drag B^1 or A^1, as the case may be, over the spaces 2 to 1 and 4 to 3, were lost; but this is not the case; there is no power whatever lost. The *difference* of travel represents both the available power and the quantity of steam used. In theory, there is neither loss nor gain. In practice, its simplicity, cheapness, and compactness give it great advantages. For screw-propellers, locomotives, and portable engines it is probably destined to find large employment.

The engines used in locomotives are always of the high-pressure or non-condensing kind, and the cylinders of small size; but they do not differ in principle from the non-condensing engines above described. For the peculiarities of the boiler, and the method of causing a powerful draught in the furnace, see BOILER.

Power of the Steam-engine in Relation to Water evaporated and Fuel consumed.—A cubic foot of water, evaporated at ordinary atmospheric pressure, expands to about 1700 cubic feet of steam; and if we suppose it boiled off in a cylinder, *a* (fig. 1), of a foot square in area, it would raise the piston against the pressure of the atmosphere; which would be equal to 2160 lbs., through 1700 feet, or 3,672,000 foot-pounds. In a cylinder with a perfect vacuum above the piston (as in the condensing steam-engine there is an imperfect one), a foot of water evaporated ought thus to give 3,672,000 units of work; or, as a cubic foot of water = 62½ lbs., a pound of water evaporated ought, theoretically, to give 58,752 units of work. Owing to the various imperfections noticed above, average engines do not give more than about 30,000; so that, without expansion, a pound of water evaporated a minute (which is very nearly a cubic foot an hour), may be roundly said to give a horse-power (q. v.), or 33,000 foot-pounds a minute.

The *duty* of an engine is the work done by the consumption of a certain amount of coals, without regard to time. An obstinate adherence to a rule introduced by James Watt for calculating the power of the steam-engines made by him, has led to great confusion in speaking of the working-power of engines. Watt's engines were made to work with a speed of the piston of 200 feet per minute, and were able to lift about 7 lbs. per square inch of piston; and so long as the speed and pressure were according to Watt's practice, his rule was correct enough; but since his time, both speed of piston and pressure on it have vastly increased; and with every increase of speed or of pressure the *real* power has increased in proportion. Watt's rule was: 'The square of the diameter of the piston in inches, multiplied by the cube root of the stroke in feet, and divided by the constant number 47, is the nominal horse power.' See HORSE-POWER. The rule now in use by the Admiralty is: 'The area of the piston in square inches multiplied by 7 lbs. steam-pressure, multiplied by the speed of the piston in feet per minute, and divided by 33,000, will give the nominal horse-power.' This rule is nearly as far off as Watt's from giving the actual power, which is in modern marine engines from three to seven times greater than the nominal power. This excess of the *actual* over the nominal power arises either from an increase in the speed of the piston, or in the pressure of steam acting on it, or from both causes combined; and an increase in either one or both involves a proportionate increase in the quantity of steam used, and therefore of fuel consumed. Extraordinary progress has been made in the last twenty years in reducing the quantity of fuel required to develop a given amount of power. From 7 to 10 lbs. of coal for each horse-power was not considered excessive, but the average consumption is now 3 to 5 lbs. Many steam-vessels are running with a consumption of only 2½ to 3 lbs. of coal per indicated horse-power per hour. Indeed, in several experimental steamers constructed by Mr J. M. Rowan of Glasgow, the consumption of fuel was reduced to 1¼ to 2 lbs. per horse-power per hour; but this economy was obtained by such an exaggeration of several well-known sources of economy, using very high-pressure steam with great expansion, great extent of heating surface in the boiler, &c., that the machinery failed to answer its purpose commercially. The difficulty and expense of keeping steam-boilers and steam-engines in good working order when very high pressures and velocities are used, are so great, that (except in the case of locomotives, where excessive speed of the piston and pressure of steam on it are both essential to develop the requisite power) moderate speeds and pressures are found to be more economical in the end. There is, however, a steady progress in the use of higher pressures and velocities; and as experience and continually improving workmanship advance, doubtless more power will be got out of steam-engines of a given size by driving them faster and with higher pressure of steam. Already the ordinary marine engine gives out four or five times more power than an engine of the same size would have done in Watt's day. Of course the steam-*boilers* must be increased in size and power, in order to supply the greater quantity of steam used by engines which run with high speed and under great pressure.

In connection with his rotary engine, Mr Thomson has invented a form of boiler, which, for generating power in proportion to surface and fuel, is represented as exceeding any hitherto tried. For the smaller class of steam-boilers the vertical form has many recommendations; but in all the vertical boilers hitherto devised there have been drawbacks of a serious kind. Thomson's patent boiler, of which a sectional view is shewn in fig. 11, combines all the good points of the vertical boilers hitherto in use, and has, in addition, its own special merits. The spherical or cylindrical generator, B, receives the full blast of the flames, which actually blow direct on it, impinging on its lower surface with a great force, and then, without losing their velocity, they are deflected against the sides of the furnace. As they rush past the narrow annular space at CC, the flames and heated gases are necessarily brought into actual contact with the sides of the fire-box and with the surface of the spherical generator. The flames and gases are forced to pass in a thin film through this narrow passage, and are thus enabled and compelled to give off to the heating surfaces

nearly all the heat they possess. By the time the hot gases have reached the tube-plate they will have parted with so much heat that they will be no longer hot enough to burn it. In the ordinary vertical boiler the tube-plate is exposed, not only to the

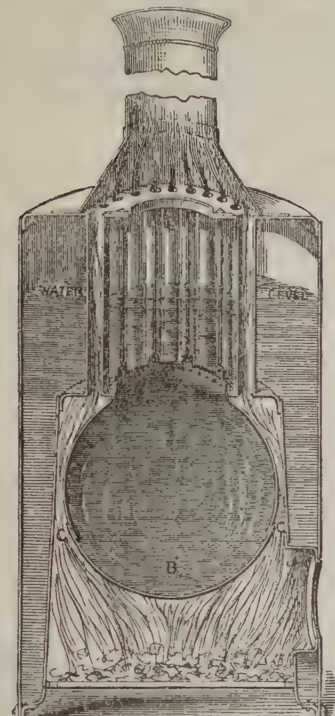


Fig. 11.

direct action of the flames and hot gases, but also to the intense heat *radiating* from the incandescent fuel, and, at the same time, the circulation of the water over the tube-plate is excessively hampered by the tubes standing all over its surface. It soon burns out, as might readily be expected. In the patent boiler the spherical steam generator, B, is interposed between the fire and the tube-plate. Its shape and position are alike perfect for receiving and transmitting to the water within the full effect of the fire without, while, at the same time, it leaves for the tube-plate and tubes only that moderate amount of work which horizontal tube-plates and vertical tubes are capable of doing without being speedily burned out. The rapid circulation of water over the internal, and the quick rush of flame and hot gases over the external surfaces of a steam-boiler, are alike essential and important for the rapid generation of steam. A sluggish and entangled circulation is no doubt the most frequent cause of the poor performances and short lives of very many steam-boilers. The mischievous effect of a coating of soot in a tube is quite well known, and care is taken to remove accumulations of soot and ash from the tubes and flues; but there is no doubt, many steam-boilers are incapable of doing their full work from the constant existence of an internal coating of steam, which in one sense is more injurious than a coating of soot outside.

Externally, neither soot nor ash can settle on any part of the generator B, and the water within whirls around with a velocity that clears the internal surface from steam as quickly as it is generated. The whirling of the water in the steam-generator B, effectually prevents the settlement of mud or any other sediment within it. Every kind of sediment is tossed out of the generator B, and finds a resting-place only in the water-space below the level of the fire-bars, from whence it can be removed from time to time, through hand mud-holes. The difficulty of cleaning out the hard deposits of lime, salt, &c., is a great obstacle to the use of the old kinds of vertical boilers. In Thomson's patent boiler, the facilities offered in this respect leave nothing to be desired. The opening of the man-hole at E, exposes to view the whole interior of the tubes, tube-plates, and central generator. They can all be seen, cleaned and repaired, without any difficulty, and without pulling any part of the boiler to pieces. For working ships, winches, evaporating salt water for the use of the crew and passengers, Thomson's patent boiler possesses extraordinary advantages.

The theory of a perfect thermic engine, which should return in mechanical motion (see FORCE) the greatest possible amount of the heat applied to it, will be considered under THERMODYNAMICS.

STEAM-HAMMER, THE, has doubtlessly contributed more than any other mechanical invention of modern times in developing the wonderful resources of the iron trade, and is still looked upon as a marvel of engineering skill and ability. The first idea of a steam-hammer appears to belong to James Watt, the great father of engineers, and was patented by him in 1784. In 1806, a William Deverell, described as 'an engineer of Surry,' also took out a patent for a steam-hammer; but in neither case does it appear that steam-hammers were actually constructed. From this time till 1837, the idea seems to have been entirely lost sight of, when it was again taken up by Mr James Nasmyth, of the Bridgewater Foundry, Patricroft, near Manchester, as the result of an application made to him by Mr Francis Humphreys, engineer to the Great Western Steam-ship Company, who had been unable to induce any forge-master to undertake the forgings required for the paddle-shafts of the *Great Britain* steam-ship, then in course of construction. Mr Nasmyth sent a sketch of his hammer plan to Mr Humphreys, who, along with Mr Brunel and others, heartily approved of the scheme, but in consequence of an alteration being made in the propelling arrangements of the great ship, the paddle-shaft was not required, and the hammer was not then constructed. The scheme was offered to many of the large forge-masters and engineers; but while all seemed to admire the idea, they failed to appreciate its value and importance, and the hammer remained a mere sketch in Mr Nasmyth's 'scheme-book' till 1842, when, in December of that year, Mr Nasmyth secured a patent for his invention, and the first steam-hammer was made in accordance with his plan at the Bridgewater Foundry early in 1843; but although considered by some as an improvement upon the old 'helves' hitherto used for forging purposes, it was very far from being a perfect or even a marketable tool. See fig. 1. The hammer was worked by means of an ordinary slide-valve and a long lever, requiring great labour and constant attention in order to give the blow required; so that some contrivance was necessary, capable of adjustment, in order to have complete command over the power of the blow, and that, the instant the blow was struck, the block should rise again, so that not only no loss of time should ensue, but that the heat in the mass of iron on the anvil might not be reduced or carried off by the cold face of the block. The peculiar

difficulty of securing a true automatic arrangement will be seen when it is considered that the instant of percussion must vary with almost every blow

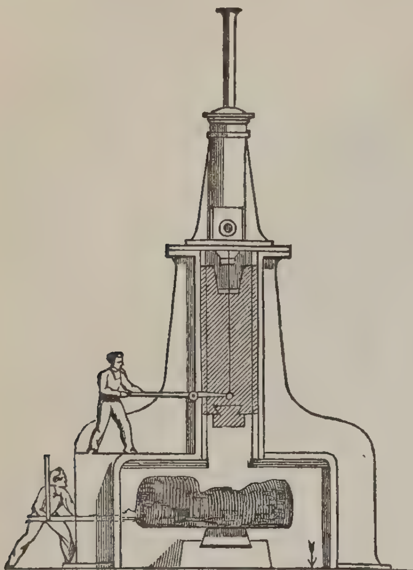


Fig. 1.

that is struck; for the piece on the anvil becomes thinner and thinner by each succeeding blow, and in flat bars, a blow is first given on the flat side, and then on the edge, the difference in the fall of the hammer in the two cases being oftentimes several inches; and further, that the hammer must be under perfect control at all times.

Mr Nasmyth, after many and protracted trials, failed to produce the motion required, and, as a consequence, the whole hammer scheme was on the point of being abandoned. In this dilemma, and during Mr Nasmyth's absence from the works, his partner, Mr Gaskell, applied to their engineering manager, Mr Robert Wilson (at this present time, 1866, managing partner and successor to Mr Nasmyth), to endeavour to solve the problem which had hitherto baffled the skill of Mr Nasmyth. Mr Wilson took the matter in hand, and in little more than a week, a motion was invented and attached to a hammer upon which former experiments had been made, and was at once found to answer most admirably every condition required. Under the influence of this very beautiful mechanical motion every variety of blow could be given, from the gentlest tap to the heaviest blow within the compass of the hammer, and that, too, perfectly self-acting in every respect, the long lever and the hard work before referred to being now entirely banished. By simply altering the position of the tappet lever by means of two screws, a blow of the exact force required could be produced and continued so long as steam was supplied. So completely was the hammer now under control, that it became a favourite amusement to place a wine-glass containing an egg upon the anvil, and let the block descend upon it with its quick motion, and so nice was its adjustment, and so delicate its mechanism, that the great block, weighing perhaps several tons, could be heard playing tap, tap, upon the egg without even cracking the shell, when, at a signal to the man in charge, down would come the great mass, and the egg and glass would be apparently, as Walter Savage Landor has it, 'blasted into space.' On the 18th August 1843, the first hammer was delivered to Messrs Hird, Dawson, and Hardy of the Low Moor Iron-works, near Bradford, Yorkshire, and gave such satisfaction, that orders for this remarkable tool began to flow in from all parts of the country. See fig. 2. The hammer remained in this condition, with the exception of a few minor details, from 1843 to 1853, when Mr Wilson (who in the interim had removed to the Low Moor Iron-works) invented, patented

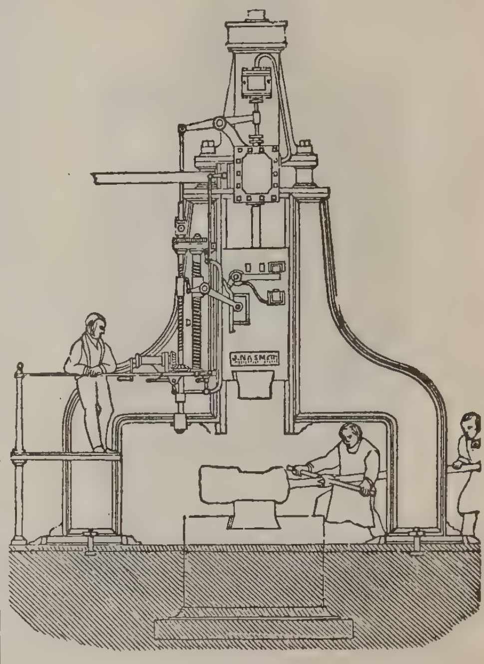


Fig. 2.

and applied to the hammers at Low Moor and elsewhere what is called the 'circular balanced valve.' The *Practical Mechanic's Journal* for 1855, vol. viii., p. 174, in an article on this invention, says: 'The wonders of Mr Nasmyth's invention, the steam-hammer, have just received new lustre at the hands of Mr Wilson, to whom belongs a large portion of the credit attaching to the early practical development of the beautiful automatic action of this invaluable tool. The special feature which Mr Wilson has introduced is his balanced-pressure cylindrical valve, several modifications of which we noticed in our pages of June and July last year. Hammers divested of all self-acting apparatus whatever, and fitted merely with a hand-geared valve of this kind, exhibit an immensely improved action, enabling the workman to obtain the exact kind of blow he wants under all circumstances. This adjustment of the hammering force is attained just as effectually as with the simple hand-hammer of the smith, one stroke giving perhaps a mere touching tap, and the next a blow of the highest intensity.'

In July 1856, Mr Wilson returned to the Bridgewater Foundry as managing partner in the firm of James Nasmyth and Company, and in September following obtained a patent for a *balanced slide-valve*, and at once arranged to apply his invention to all hammers subsequently to be made there, which arrangement continues in operation to the present

time. His balanced slide-valve, by a most ingenious arrangement, allows the valve, as it were, to float in an atmosphere of steam pressing equally upon it on every side, entirely doing away with all superincumbent pressure upon the *valve*, no matter what the pressure in the *boiler* may be. The great advantage of this invention will be apparent when it is stated that hammers are now made of such a size, that, were they worked by an ordinary valve, a power equal to at least 10,000 pounds would be required to work the valve alone, but by means of this invention there is no appreciable pressure whatever, and consequently little or no power required for that purpose.

In June 1861, Mr Wilson patented and introduced another very important improvement, popularly known as the *double-acting hand-gear motion.* By this arrangement, the steam is admitted as before to *raise* the piston, and when it has attained the required elevation, and at the very moment when about to descend, by slightly increasing the travel of the hand-lever (more than when working single-acting), the steam is admitted into the cylinder *above* the piston, which accelerates and increases the intensity of the falling blow and the consequent capacity of the hammer; so much so, that that which had hitherto been described as a 5-*ton* hammer is by this double-action arrangement increased to at least a 12½ or 15 ton one. This great improvement appears to have been produced at precisely the right time, for, in consequence of iron and steel being now so extensively used in the construction of our ships of war, tools and appliances of a heavier and more powerful class than any hitherto in existence are required for manipulating the large plates, shafts, &c., now used in the construction of these floating monsters of the deep.

In 1862, Mr Wilson designed and constructed a small hammer suitable for tilting steel, fitted with the balance-valve, double acting, and with an entirely new self-acting motion (much less complicated than the original one), capable of striking *five hundred* blows per minute.

Hammers, as now constructed, appear as near

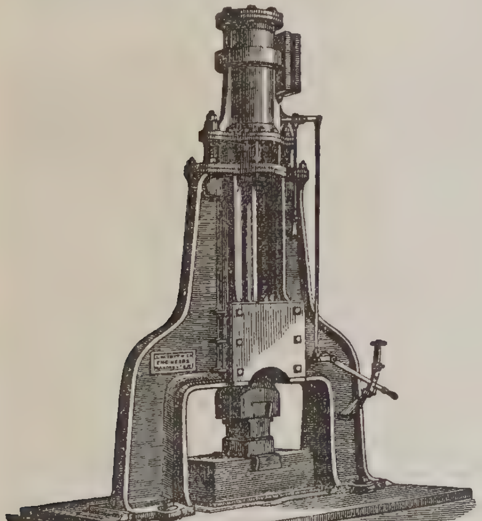


Fig. 3.

perfection as it is possible to conceive them to be, and with blocks of all sizes. from 2 cwt. to 25 tons; notwithstanding, those of the largest and most powerful class are, by means of the improvements above described, worked with as much precision and ease as the merest toy. See fig. 3.

STEAM-NAVIGATION. When once steam was known as a moving power, its application to navigation was obvious enough; it was even to this purpose that the first attempt was made to apply it at all—that of Blasco de Garay—namely, in the harbour of Barcelona in 1543. See STEAM-ENGINE. The only surprising thing is, that thirty years should have elapsed—between 1777, when the steam-engine had become in Watt's hands an efficient power for other purposes, and 1807, the date of Fulton's first voyage—before a really serviceable steam-vessel was produced. The connecting link seems to be the use of revolving-paddles instead of oars. Wheel-boats propelled by oxen, horses, or men were known to the Romans, and were used for ferry-boats in modern times. Some experiments with this mode of propulsion made by Mr Miller of Edinburgh, suggested to his friend Mr Taylor the application of steam as the moving power, and led to the most decided step in the discovery of steam-navigation previous to the final success of Fulton.

As early as 1736, Jonathan Hulls had taken out a patent for a tow-boat to be propelled by a paddle-wheel set in motion by a sort of steam-engine. The project appears never to have been executed. Besides some experiments on the Seine by Comte d'Auxiron in 1774, and Perier in 1775, the Marquis de Jouffroy constructed a steamboat of considerable size in 1782, which navigated the Saone for some time; it was deficient, however, in power. The pioneer in steam-navigation was John Fitch of Philadelphia, who, in 1786, propelled a boat by steam upon the Delaware river, and in 1790, another, as a passenger boat, plied for six months upon the same river, running more than 2000 miles at an average speed of 7½ miles per hour. See *Memoir of John Fitch*, by C. Whittlesey, and *Life*, by Thompson Westcott.

The next important experiment was the one above alluded to, by Messrs Miller and Taylor. It took place on a small lake on Mr Miller's estate of Dalswinton in Dumfriesshire. A small engine having four-inch cylinders of brass was prepared, under the superintendence of Mr Taylor, tutor in Mr Miller's family, and Mr Symington, an ingenious mechanic, and fitted on board a double-boat, with a paddle-wheel in the interspace. The trial took place amid a concourse of hundreds on October 14, 1788, and with perfect success. Next year Mr Miller had larger engines fitted into a vessel, and tried on the Forth and Clyde Canal, when the vessel moved at the rate of seven miles an hour. Partly from caprice, partly from derangement of his affairs, Mr Miller was diverted from pursuing the matter farther. But in 1801, Mr Symington took out a patent for the construction of steamboats, and in 1803 built the *Charlotte Dundas*, to tow vessels on the Forth and Clyde Canal. The success seems to have been complete, excepting in one respect, that the agitation of the water by the paddles was found to wash down the banks in an alarming manner. The use of the vessel was therefore given up, and it lay at *Lock Sixteen* for many years.

In the meantime, attempts had been making at steam-navigation in America by Stevens, Livingston, and others. Robert Fulton, another American, had thought of steam as a motive-power for vessels as early as 1793. Travelling into Scotland he visited the unfortunate *Charlotte Dundas*, and obtained drawings of the machinery. Returning to America with one of Bolton and Watt's engines of 20 horse-power, he, in conjunction with Livingston, built a vessel called the *Clermont*, at New York, and is

1807 made the first really successful voyage by steam from New York to Albany, up the Hudson. The vessel sailed 110 miles in 24 hours, against stream and wind. Fulton has thus indisputably the honour of having first proved the practical utility of steam-navigation. Yet nothing but perseverance seems to have been wanting to crown the experiments of Miller, Taylor, and Symington with equal success. Five years later, 1812, Henry Bell of Glasgow, who had witnessed the experiments on the Canal in 1789, and had accompanied Fulton on his visit to the *Charlotte Dundas*, started a steamboat, the *Comet*, on the Clyde, and was thus the father of steam-navigation in Britain.

In 1815, a steamboat made a passage from Glasgow to London, and in 1818, one plied from New York to New Orleans; it was not till 1820 that steam-packets were established between Holyhead and Dublin. 1838 was a memorable year in the history of steam-navigation. The steamer *Sirius* sailed from Cork on the 4th of April, the *Great Western* from Bristol on the 8th of the same month; both arrived at New York on the 23d, the *Sirius* being only twelve or fifteen hours before the other. The passage is now often made from New York to England in eight or nine days. Steam-vessels are now to be found on all seas and lakes and navigable streams. War-steamers have taken the place of the old ships of the line; and except for the transport of heavy goods to long distances, steam bids fair to supersede the use of sails. The maximum speed yet attained by steam-vessels is 20 miles an hour; the ordinary rate 8—15 miles.

The steam-engine employed to propel a vessel does not differ essentially from any other; but some modifications are necessary, chiefly with a view to secure lightness and economise space. The beam is placed, not above the cylinder, but more on a level, and is often altogether dispensed with, the motion being communicated to the crank by more simple connections, and in the case of the oscillating cylinder, directly by the piston-rod. It is common to have two distinct engines working separate cranks upon the same axle. See STEAM-ENGINE; PADDLE-WHEEL; SCREW-PROPELLER.*

* On the conflicting claims to the merit of this invention, we may here note, in addition to what is said under the head of Screw-propeller, that the application of the screw to the propulsion of vessels is well known to have been tried at least before the middle of the 18th century. In the *Traité de Navire* by Bouguer (Paris, 1746), it is stated that 'revolving arms like the vanes of a windmill were tried for the propulsion of vessels.' In 1751, Daniel Bernouilli, the famous mathematician, in his *Recueil d'Ouvrages Curieux* describes and gives drawings of the screw-propeller. In 1770, James Watt mentions a screw-propeller in a letter to Dr Small, who replies that he had tried it. In 1776, D. Bushnell, an American, in an account of a submarine vessel, describes a screw-propeller for moving it. In 1804, J. Stevens tried at New York a vessel fitted with a screw-propeller driven by a steam-engine made by Boulton and Watt. This appears to be the first attempt at propulsion by the screw with steam as a moving power. Colonel Beaufoy has described a spiral oar or screw-propeller, with two spiral rims fixed on arms, which he had seen used in China about the year 1780. Since the beginning of the present century, several hundred patents have been taken out for screw-propellers, and it would be a hopeless task to try to allot to the different claimants their due shares of merit. Hard and costly experience—mere 'trial and error'—have contributed more to the present perfection of the screw than any recent 'inventions.' The name most widely known in connection with the introduction of the screw-propeller is that of Mr Francis Pettit Smith, a farmer near London, who took out a patent in May 1836 for a screw-propeller. This gentleman, who was by no means the first who tried to get the screw into use, was fortunate enough to obtain the assistance of influential capitalists, and after various trials on a small scale, he fitted up the *Archimedes*, a regular sea-going vessel. The complete success of this the first real trial on a large scale, gave to Mr Smith a position which he had well earned, not by his invention or improvement of the screw-propeller, but by demonstrating to the world on a large scale its capabilities. Other inventors were before him in point of time, but most of them confined their operations to trials of models, or, at most, to small boats fitted with screws which were driven by hand. Mr Robert Wilson was very early in the field. He made and exhibited working models of a vessel propelled by a screw in the years 1821—1825. In 1827, his scheme was brought under the notice of the Admiralty, but rejected. From 1828 till 1832, Mr Wilson brought his schemes before various public bodies in Scotland. Small grants were made by the Highland Society and the Society of Arts for the purpose of testing the efficiency of the screw-propeller, and reports of a favourable tenor were made as to its performance in a boat which was tried at Leith under the directions of a committee of the Society of Arts in 1832. Mr Bennett Woodcroft, Mr Robert Wilson, and many others, have contributed greatly to the introduction of the screw-propeller; but as Mr Smith, aided by his moneyed associates, was the first to put the screw into a big ship, and boldly go to sea in her, the world will continue to give him credit for introducing the screw-propeller into actual use, and sometimes, but with less justice, he will get credit for having invented it

STEA'RIC ACID AND STE'ARIN. The composition of stearic acid is represented by the formula $C_{18}H_{36}O_2$; this acid being one of the solid fatty acids represented by the general formula $C_nH_{2n}O_2$. It exists as a glyceride (stearin) in most fats, and is especially abundant in the more solid kinds, such as mutton-suet. It is readily obtained by saponifying suet, and decomposing the hot solution of the soap by tartaric acid. The oily acids which are thus liberated are compressed between hot plates, by which means most of the Oleic Acid (q. v.) which is present is expelled. The solid residue is then to be repeatedly crystallised from alcohol, and afterwards from ether till the fusing-point becomes constant at 159°. If the final solution is allowed to cool slowly, the acid is deposited in beautiful colourless transparent rhombic plates. After fusion it cools into a wax-like, glistening, crystalline mass, devoid of taste or smell. It is insoluble in water, on which it floats, but dissolves in alcohol and ether, its solution reddening litmus powerfully. When heated above its fusing-point, it becomes decomposed into palmitic acid ($C_{16}H_{32}O_2$), palmitone ($C_{31}H_{62}O$), and an oily hydrocarbon. Stearic acid forms both normal and acid salts. The only normal stearates which are soluble in water are the stearates of the alkalies, whose solutions are frothy and form a lather, but on the addition of an excess of water, separate into an acid salt which is deposited in silky crystalline plates, and the free alkali which remains in solution. The stearates of the alkalies are also soluble in alcohol. Chloride of sodium (common salt) has the property of separating the alkaline stearates from their solution. The stearates of the alkalies are the principal constituents of the different kinds of soap. The other stearates are insoluble. Stearate of lead, which is one of the constituents of lead-plaster, is readily formed by mixing solutions of stearate of soda and acetate of lead, when the stearate of lead falls as a heavy amorphous precipitate, sparingly soluble in alcohol or ether, but dissolving freely in oil of turpentine.

The *Bassic Acid* extracted from the oil of the seeds of *Bassia latifolia*, a tree growing in the Himalaya, and the *Stearophanic Acid* obtained

from the berries of *Monospermum Cocculus*, are identical with stearic acid.

The use of stearic acid in the manufacture of candles is described under the head CANDLE. See also OILS AND FATS.

STEARO'PTEN. See OILS AND FATS.

STE'ATITE, or SOAP-STONE, a mineral principally composed of silica and magnesia, with more or less alumina and water. It is found massive, or sometimes assuming the forms of the crystals of other minerals which it has replaced. It is plentiful in many parts of the world, and is found in various parts of America. It is generally white, reddish white, or yellow. It is soft and greasy to the touch, easily cut, but broken with difficulty. It is used in the manufacture of porcelain. It writes readily on glass, and is used by glaziers for marking plates of glass before they are cut with the diamond. Tailors use it for marking cloth before they cut it. It is also used by shoemakers, to give unctuosity to the heels of stockings, that new boots may more easily be tried on. It is sold for such purposes under the names of Briançon Chalk, French Chalk, and Venice Talc. It readily absorbs oil or grease, and is used in powder for extracting spots of them from silken and woollen stuffs. It is the basis of Rouge (q. v.). It is used for imitating engraved stones, being easily cut, and afterwards hardened by heat; after which, it may be coloured by metallic solutions. The *Agalmatolite* or *Figure-stone* of China is a kind of S., containing a little potash. Exquisite specimens of Chinese workmanship in this material are now familiar to every one. The earth which is eaten by the savages of the banks of the Orinoco is a kind of soft steatite.

STEEL. See IRON.

STEEL, JOHN. See SUPPLEMENT in Vol. X.

STEELBOW, in Scotch Law, means goods, such as corn, cattle, straw, and implements of husbandry, delivered by the landlord to his tenant, by means of which the latter is enabled to stock and labour the farm, and in consideration of which he becomes bound to return articles equal in quantity and quality at the expiration of the lease.

STEELE, SIR RICHARD, was born in Dublin in the year 1671. His father, who held the office of secretary to the Duke of Ormond, was of an English family, but his mother was Irish; and the son appears to have inherited from her the impulsive ardour, tenderness, bright fancy, and reckless profusion immemorially ascribed to the Irish national character. He was educated at the Charter-house School, along with his illustrious friend Addison, and from thence was removed to Merton College, Oxford. Leaving college without taking a degree, he enlisted in the Horse Guards, for which imprudence he was disinherited by a rich relation of his mother, who had named him as heir to an estate in Wexford. In the army, he rose to the rank of captain, but was gay, thoughtless, and dissipated—always sinning and repenting, as he himself confesses. To impose a check on his irregularities, he wrote a religious treatise, *The Christian Hero*, published in 1701, the design of which was to shew that no principles but those of religion are sufficient to make a great man. This public profession of seriousness had little effect on the volatile captain, and he next took to writing comedies. In 1702, he produced *The Funeral, or Grief à la Mode;* in 1703, *The Tender Husband;* and in 1704, *The Lying Lover*—the last a decided failure. About the same time, he obtained some fortune by marrying a West Indian lady, who survived the marriage only a few months; and in 1706, he got the appointment of Gazetteer, with a salary of £300 per annum, and also the post of Gentleman Usher to Prince George, which added another £100 to his income. In the following year (September 9, 1707), he married a Welsh lady, Mary Scurlock, who figures conspicuously in his correspondence as the 'Dearest being on earth,' 'Dear Prue,' and 'Dear wife,' to whom he addressed some 400 letters—admiring, apologetic, and passionate. A course of extravagance—town and country houses, horses and chariots—soon involved the pair in difficulties. Mrs Steele had a fortune of £400 a year, and was thrifty; but the lady's mother had a life-interest in the estate, and was hard and uncongenial. Addison gave a loan of £1000, which was repaid within a twelvemonth; but he made other advances, secured by a bond on house and furniture. He put the bond in execution, sold the house and furniture, and remitted the surplus to his imprudent friend. For this seeming harshness Addison has been blamed; but it rests on good authority that the sufferer himself entertained no such feeling: he regarded the incident as a warning meant to do him service, and he met his friend again with his wonted composure and gaiety. In 1709, S. commenced *The Tatler*, a periodical published thrice a week, containing short essays on life and manners, town gossip or *tattle*, and articles of foreign and domestic news, for which S.'s appointment of Gazetteer furnished him with peculiar facilities. Addison joined cordially in this publication, and still more effectively in its successor, *The Spectator*, a daily literary journal of a higher tone and character, which was continued with unexampled success through 635 numbers. A third miscellany of the same kind, *The Guardian*, was extended to 175 numbers. S. afterwards attempted other periodicals, as *The Lover*, *The Reader*, &c., but these were short-lived. His fame rests on his essays in the *Tatler*, *Spectator*, and *Guardian*, to which he contributed respectively 188, 240, and 82 papers. In the keen political strife of that venal age, S. fought courageously and honestly for the Hanover succession and Whig principles. He lost his office of Gazetteer, and was expelled the House of Commons, for writing a pamphlet called *The Crisis*, in which he warned the nation that the Protestant cause was in danger. But when Queen Anne died, and the Whigs were again triumphant, S. participated in the royal favour. He obtained an appointment in the king's household, was elected M.P. for Boroughbridge, and received the honour of knighthood. In 1717, S. was nominated one of the commissioners for the forfeited estates in Scotland, and he seems to have made four annual visits to Edinburgh on the business of this commission. He was led into a controversy with Addison, a few weeks before the death of the latter, on the once-famous Peerage Bill—a proposal by ministers for restraining the king from any new creation of peers, except upon the extinction of an old family. On this question S. took the side of the crown, and fairly beat his opponent in argument and in temper, besides enjoying the triumph of seeing the bill thrown out. The friends, alas! met no more. The survivor struggled on among controversies, embarrassments, and lawsuits; he was patentee of Drury Lane Theatre; and in 1722, he produced his admirable and successful comedy of *The Conscious Lovers.* His health now rapidly failed. His wife had died in 1718, but he had children to solace his decline. The last three years of his life were spent in retirement in Wales, and there his chequered existence came to a close: he died at Llangunnor, near Carmarthen, on the 21st of September 1729.

The essays of S. have eclipsed his dramas. His Bickerstaff, the Spectator Club, allegories, and short tales have the true, ever-living dramatic spirit. In

taste and delicate humour, he was greatly inferior to Addison; but in invention and insight into human character and motives, he was fully his equal. He knew the world better, and he sympathised with almost every phase of life and character except meanness and cruelty. He seems to have considered it to be his special mission to reform the minor vices and absurdities of English society. If his satire had been more keen and trenchant, or his moral lessons more formal and didactic, he could not have succeeded as he did: his essays were just adapted to the times—they insinuated morality and benevolence, and supplied innocent enjoyment mingled with instruction. The lively, natural writer and companion is never lost in the teacher, nor the gay captain of horse wholly absorbed in the author.

STEEL TOYS. This is a manufacturing term much used in Birmingham, London, and elsewhere. It has a somewhat different meaning from that which would at first sight be given to it. Steel toys are small articles, such as cork-screws, buckles, boot-hooks, and a great variety of similar objects, when made of polished steel. Birmingham and Sheffield are the chief seats of this industry, which employs a large number of operatives and considerable capital.

STEE'LYARD. See BALANCE.

STEEN, JAN, a celebrated Dutch painter, was born in 1626, or according to others in 1636, at Leyden, where his father was a brewer. He shewed an early predilection for art, which led to his being apprenticed to a German painter, Nicholas Knupfer of Utrecht. Subsequently he became a pupil of Van Goyen, whose daughter Margaret he married. Very soon his repute became established. As he worked, however, in a slow and elaborate manner, his gains were insufficient, and he started a brewery at Delft. This enterprise promised fairly; but, according to tradition, he was by no means of steady business habits, and so bemused himself with his own beer that very soon he brewed no more of it. Little that is certain appears to be known regarding the subsequent life of S., but numerous unauthenticated anecdotes are in vogue, which, if it could be shewn that they were true, would prove him to be a wretched drunkard; but a late biographer, Van Westerheene, throws considerable doubt on the accuracy of the popular impression. S. died in 1679 or 1689, leaving his family in very destitute case.

As an artist of the Dutch school he ranks high; and his works are now much valued. In humour and spirit they are scarcely surpassed, and their colouring is clear, fresh, and delicate. At times he attempted historical subjects, but his success in these was not great. It was in homely and domestic scenes that his genius truly exhibited itself; and in this field he has scarcely since been quite equalled.

STEEPLE, the tower and spire, lantern, or other superstructure attached to a church. These are usually of stone, but in some cases are carried up from the floor in massive wooden framing.

STEEPLE-CHASE. This singular term is used to designate a kind of horse-race, run not on a prepared course, but across fields, hedges, ditches, and obstacles of every kind that may happen to be in the way. The name and practice are said to have both originated in a party of unsuccessful fox-hunters, on their return home, agreeing to try a race towards the steeple of a village church, the first who could touch the church with his whip to be the winner. This kind of sport soon became popular; and matches were made and sweepstakes entered into—the requirements of the course being simply two flagstaffs placed about two miles apart, from one of which the competitors started, made their way to the other, and returned to the starting-point. Each rider was allowed to go and come as he chose, but the country was often selected on account of its difficulty; high and strong fences, deep and broad ditches, and sometimes even swollen rivers having to be crossed and recrossed. Then came the more regular steeple-chase of modern times over a course marked out by flags, between which the rider must pass in order to win the race. This improvement was introduced about the end of last century, and no further change took place till 1841, when *handicapping* began. This consists in the weighting of horses according to their supposed merits, without reference to age, size, or sex. The first handicap steeple-chase was run at Newport-Pagnell on April 20, 1841, and the sport has since become more and more popular in England, most of the spring and autumn meetings having their steeple-chases, for valuable stakes. Great crowds of people always attend, the very danger of the sport seeming to increase its attractiveness. Serious accidents are not unfrequent; and great courage, coolness, resolution, and judgment are requisite on the part of the rider in a steeple-chase.

STEE'RAGE, in a vessel, is the lowest class of accommodation for passengers.

STEERING is the act of directing the ship's course by means of the Helm (q. v.). It is bad steering when the ship's head is allowed to oscillate first on one side and then on the other of the course she has to pursue. By such steering the distance to be traversed is increased, and a greater resistance is encountered, the sea being struck more obliquely.

STEIN, HEINRICH FRIEDRICH KARL, BARON VON, one of the greatest statesmen that ever conducted Prussian affairs, belonged to an old Rhenish-Franconian family, and was born at Nassau, October 26, 1757. He studied at Göttingen from 1773 to 1777, entered the service of Prussia in 1778, and in 1784, had risen to be at the head of the department of mines for Westphalia. In 1786, he visited England in company with his friends, the Counts von Redern and Schlahberndorf, and carefully studied the institutions of that country, for which he conceived a high admiration, and sought to introduce them at a later period into Prussia. After several minor preferments, he was appointed, in 1797, president of the Westphalian chambers, where he displayed rare administrative talent. In October 1804, he entered the Prussian ministry as chief of the department of indirect imposts, taxes, manufactures, and commerce. In this capacity he effected important ameliorations, particularly by abolishing various restrictions on the internal trade of the nation; yet to his great grief and vexation he found himself incapable of modifying the policy that resulted in the French invasion and conquest. Of a thoroughly conservative and religious disposition, full of pious reverence for the past, so far as it possessed vital energy, but strongly opposed to bureaucracy and military despotism; recognising in the self-governing powers of communities and provinces the only practical guarantee of national liberty, yet, as a baron of the empire, hostile to the anarchic sovereignty of little states, he occupied a political stand-point which procured for him many adversaries and few friends. In 1807, he was dismissed from office by the king, and withdrew to his estate in Nassau; but the peace of Tilsit opened the eyes of his sovereign to the wisdom of S.'s policy, and in less than seven months he was recalled, with the approbation of Napoleon, who had as yet no idea of the deep and earnest patriotism of the minister. S.'s industry was untiring. Seeing clearly

that, in a military point of view, Prussia was powerless for the moment, he set about developing her internal resources by attempting a series of administrative and political reforms, known as *Stein's System*—the principal of which were the abolition of serfage, with indemnification to the territorial lords; the subjection of the nobles to manorial imposts; equality of orders in the sight of the law; the universal obligation of military service; promotion in the state by merit alone, without distinction of caste; and the establishment of a municipal system analogous to that of England. Some of these reforms were carried out by S., and others by his successor, Hardenberg (q. v.).—Meanwhile, he had become suspected by Napoleon. Among other things, an intercepted letter was brought to the French emperor, in which his policy was sharply criticised. S. was obliged to resign (November 1808), and retired to Austria, where he became the centre of a secret national society—the *Tugendbund*. Napoleon, who bitterly hated patriots that stood in his way, confiscated his property. In 1812, S. was summoned to Russia by the Emperor Alexander, and contributed by his counsels to prepare the coalition against Napoleon. After the march of the allies into Saxony, he was appointed president of the council of all the German States; was a leader in all the military diplomacy of that stirring time up to the Congresses of Vienna and Aix-la-Chapelle, in which, however, he took no part, owing to the intrigues of the Bavarian minister, acting for the lesser states of Germany, who knew well that he did not look with a favourable eye on their anarchic autonomy. The absolutists were also against him. S.'s active political career was now finished; henceforth he enjoyed some honourable functions, but no power, and died at Frücht, July 29, 1831.—See Pertz's *Leben des Freiherrn von Stein* (Berl. 1855; 2d ed. 1856). His correspondence with Humboldt, Gneisenau, Eichhorn, Gagern, Niebuhr, &c., is extremely valuable for the political history of the period.

STEI'NBOK. See BOUQUETIN.

STELLA'RIA. See STITCHWORT.

STE'LLERINE (*Rytina*), a genus of *Cetacea*, of the family *Manatidæ* (q. v.), of which only one species is known (*R. gigas*), about 25 feet in length, a native of Behring's Strait, and never observed since the middle of last century, so that it is supposed to be extinct.

STE'LVIO, PASS OF THE (Ger. *Stilfserjoch*), the highest carriage-road in Europe (9176 feet above the sea-level), leads from Bormio, on the Italian side of the Tyrolese Alps, near the head of the Valteline, to Glurns on the Austrian side. It forms part of the great road between Milan and Innsbruck, and was completed by the Austrian government in 1828, at an expense of 3,000,000 florins. The praise bestowed on it in Murray's *Handbook for Southern Germany* is well deserved: 'Whether we consider the boldness of the design, the difficulties of its execution, from the great height and exposure to storms and avalanches, or the grandeur of the scenery through which it passes, the route of the Stelvio is the most remarkable in Europe.'

STEM, in Botany, that part of the plant which, arising from the surface of the ground, and shooting upwards as the root shoots downwards, bears the leaves and flowers. Stems are either simple or branched. They are herbaceous or woody, solid or hollow, jointed or unjointed. Sometimes they are weak so as to be procumbent, although more generally firm and erect; sometimes weak stems are twining, or they are upheld in various other ways by the climbing habit of the plant. Stems are generally round, but sometimes compressed or angular. The arrangement of the leaves and branches, in reference to the stem, is symmetrical, but plants differ from each other in the nature of this arrangement. In the branching of trees, the symmetrical arrangement is often lost, as to the principal branches, in consequence of the death of some of them. In many plants the stem is obsolete, or so abbreviated as to be inconspicuous, forming a mere neck—the *crown of the root*—where the leaves and flower-stalks spring as at once from the root. Very important differences in the structure of stems distinguish the three great classes of plants—Acrogenous (q. v.), Endogenous (q. v.), and Exogenous (q. v.). Stems sometimes creep along the ground, or even under the ground, when they receive the name *rhizome* or *root-stock*.

STEM, of a ship, is that very powerful piece, or combination, of timber, which, being scarfed to the fore-end of the keel, rises nearly perpendicularly to form the bow and cutwater. To it are rabbeted the fore-ends of the planks. It is backed by an equally powerful timber called the Stemson, bearing the same relation to it as the Keelson (q. v.) does to the keel. See also SHIP-BUILDING.

STE'NCILLING, a method of printing letters or designs. The process consists in cutting out the pattern in a thin plate, usually of metal; this is then laid on the surface intended to receive it, and the colour is rubbed into the cut space with a brush, the plate preventing the contact of the colour, except on the space cut out. It is much used for wall and other surface-decoration, as it is a rapid and cheap process.

STE'NDAL, a town of Prussia, province of Saxony, situated on the river Uchte, 38 miles north-north-east of Magdeburg. Pop. about 10,000. It has a cathedral, founded in 1188, five churches, and a gymnasium, and carries on important manufactures of woollens, cottons, tapestries, tobacco, gloves, &c. S. was the capital of the *Altmark* of Brandenburg.

STENO'GRAPHY. See SHORTHAND.

STEPHEN, ST, THE DEACON, called also the Protomartyr, or earliest of the Christian martyrs, was one of the seven deacons whose appointment is related in the 6th chapter of the Acts of the Apostles. The circumstances of his martyrdom are related in the same chapter. His festival is fixed during the festivals which accompany that of Christmas. It is kept with great solemnity, both in the east and in the west. His relics were believed to have been discovered in the beginning of the 5th c., the 'discovery' being commemorated by a festival held on the 3d of August.—In the calendar of the Roman Catholic Church are several other saints of the same name, of whom perhaps the most remarkable is Stephen, king of Hungary in the early part of the 11th century. He died in 1038. His memory is held in great veneration throughout Southern Germany, and churches are met everywhere, dedicated to his name.

STEPHEN, the name of ten popes of the Roman Catholic Church. It is only necessary to refer in detail to the following. STEPHEN I. was the successor of Lucius III., in 253, and his pontificate (253—257) is memorable as affording a topic for the historians who discuss the question as to the early evidences of a Roman *primacy*. The history of Stephen I. is urged as an argument by each party in support of its own view. The advocates of the primacy infer, from several examples of the deposition of bishops by S. in various places, that a power equivalent to the modern primacy of Rome

was even then acknowledged. The adversaries of the primacy contend that the resistance offered to S. by Cyprian (q. v.), on the rebaptising of heretics, is altogether irreconcilable with the general recognition in the 3d c. of any supremacy on the part of the bishop of Rome.—STEPHEN III. plays a most important part in the history of the temporal sovereignty of the Roman see. He was a native of Rome, and was in possession of the see during the occupation (which practically dates from the year 752) of Ravenna, the Exarchate, and the Pentapolis, by Astolphus, king of the Lombards. That king having invaded Rome, and the Byzantine emperor, Constantine Copronymos, having left unheeded the appeals of S. and the Romans for succour, S. had recourse to Pepin, king of the Franks. The latter in vain sent legates to Astolphus, and the pope returned to France with the legates to solicit in person the aid of the Frank monarch, whom he solemnly crowned. Pepin agreed to compel the Lombards to withdraw from these provinces (which form the portion of the states lately in occupation of the Roman see known as the 'Legations'), and to bestow them on the see of Peter. The Lombard king made a promise to that effect; but on Pepin's withdrawal, again renewed his pretensions, and marched upon Rome. S. therefore again recalled Pepin in a most curious letter written in the name and person of St Peter, an invitation with which Pepin at once complied; and having again forced Astolphus to withdraw, he again (notwithstanding a demand from the Byzantine emperor for their restoration to the empire) reinstated the Roman see in its sovereign rights. S. died in 757.—STEPHEN VII., elected in 896, has supplied to historians much matter of discussion, from his strange proceedings in disinterring the corpse of his penultimate predecessor, Formosus, stripping it of its pontifical garments, and condemning it, after a juridical procedure, to lay burial. The circumstances of this curious conflict are not fully understood.—STEPHEN X. was one of the remarkable series of reforming popes in the 11th c., who are believed to have been elected under the influence of the celebrated Hildebrand, and who, by their energetic rule, prepared the way for that great scheme of ecclesiastical organisation of which the pontificate of that eminent man, under the name of Gregory VII. (q. v.), was the final development. It ought to be observed that, although in the series of the POPES (q. v.) printed in this *Encyclopædia* ten pontiffs named Stephen are recited, other catalogues reckon but nine; the discrepancy arising from the omission by some of Stephen II., who was elected in 753. This pontiff died before consecration, and is therefore by some excluded from the series of popes; but, as his election was complete and canonical, we have included his name in our general catalogue.

STEPHEN, king of England, was the third son of Stephen, Count of Blois, by Adèle, or Alise, daughter of William the Conqueror, and was consequently nephew of Henry I., and cousin of Matilda, daughter of Henry. He was born in 1105, brought over to England at an early age, and became a favourite with his uncle, who bestowed on him large estates, both in that country and in Normandy, and procured for him a marriage with Mahout, or Matilda, daughter of Eustace, third Count of Boulogne, and younger brother of the famous Godfrey of Bouillon. By this marriage S. not only inherited the earldom of Boulogne on the death of his father-in-law (1125), but also became related to the royal family of Scotland, for his wife's mother, Maria, was a daughter of Malcolm Canmore. When his uncle Henry resolved to settle the crown on his daughter Matilda, whose first husband was Henry V., emperor of Germany (whence she is often spoken of as the 'Empress Maud'), he naturally relied on his project receiving the support of his nephew; and at a council held in London, January 1127, S., along with all the other dignitaries of the land, lay and ecclesiastical, took the oath of fealty to Maud. A few months later, the widowed empress married Geoffrey Plantagenet (q. v.). On the death of Henry I. (December 1, 1135), S., knowing well the temper and wish of the English people, hurried over to England from Normandy, where he had been in attendance on his dying uncle, and before the year was out had got himself surrounded by a powerful body of the nobles and clergy and crowned at Westminster. His usurpation of the throne was confirmed by a bull of Pope Innocent. But S. was doomed to find his crown a crown of thorns. Although a gallant, generous, handsome prince, immeasurably superior in personal and royal virtues to Maud (who was suspected of having murdered her first husband, who quarrelled with her second, and was altogether a fiery, insolent, unwise, and exasperating female); yet it must not be forgotten that on S. rests the responsibility of causing a civil war as sanguinary, if not as protracted, as the famous *Wars of the Roses*. Listen to the *Saxon Chronicle:* 'In this king's time, all was dissension and evil and rapine. . . . . Thou mightest go a whole day's journey, and not find a man sitting in a town, nor an acre of land tilled. The poor died of hunger, and those who had been men well-to-do begged for bread. Never was more mischief done by heathen invaders. . . . . To till the ground was to plough the sands of the sea. This lasted the nineteen years that Stephen was king, and it grew continually worse.'

We have not space to narrate in detail the struggle of these nineteen years. It is enough to say, that in February 1141, after five years of the hardest fighting imaginable—against David of Scotland, uncle of Maud, who had taken up arms for his niece (see STANDARD, BATTLE OF THE); against Robert, Earl of Gloucester, natural son of the late king Henry, who had also raised the standard of his half-sister; against individual nobles who simply wished to live in anarchic and barbarous independence; and finally, against the power of the church, which he vainly sought to diminish—he was taken prisoner by the Earl of Gloucester, and placed in chains in the Castle of Bristol. Maud was now elected queen by her own party, but her rapacity and other bad qualities soon made her rule intolerable, and the wife of the imprisoned S. (also called Maud or Matilda) found it possible to continue the war, by the help of the Londoners, who were staunch adherents of her husband. S. obtained his liberty in exchange for the Earl of Gloucester, who had fallen into the hands of S.'s friends at Winchester, and the war was resumed with greater violence than ever. The death of the Earl of Gloucester, in 1146, forced Maud to take refuge in Normandy; but a conspiracy of nobles, headed by Ranulph, Earl of Chester, and another quarrel with the church, kept S.'s hands as full of work as before, and no sooner were these matters settled, than Maud's son, young prince Henry, appeared in England (1153), at the head of an army to support his claim to the throne. Fortunately for the nation, so sadly wasted and desolated, a compromise was effected between the two rivals, which saved the necessity of further bloodshed—S. agreeing to acknowledge Henry as his successor. S. died at Dover the year after (25th October 1154).

STEPHENS (Fr. *Estienne*). The family of the celebrated printers and publishers of this name (descended from a noble Provençal family) is found

settled at Paris towards 1500 in the person of Henry Stephens, supposed to have been born about 1470, and died in 1520. In Paris, Henry carried on the business of printer and bookseller for upwards of twenty years. In 1526, Robert, his second son, born in 1503, is found in possession of the business. Every year of Robert's life is marked by the issue from his printing-press of several volumes, many of them masterpieces of art, and all of them surpassing anything of the kind previously seen in France. He was at once printer, publisher, commentator, and author. Though prosperous, he shewed unmistakably that truth—or that which to him was truth—was of more value in his eyes than worldly gain. Having secretly become a convert to the doctrines of the Reformation, he endeavoured for some time to reconcile his convictions with the outward demeanour required by his position. But the convictions were too strong, or the nature of the man too truth-loving. His Bible of 1545, and his Greek Testament of 1549, each drew down upon him a public prosecution; and though the prosecutions failed legally, they were disastrous to his private fortune. Having first sent his family to Geneva, he followed them there in 1549. Robert, his second son, shortly afterwards returned to Paris, where he resumed his father's business, returning to the Roman Catholic church.

In flying from Paris to Geneva, the S. family found that they had but exchanged Roman Catholic for Protestant persecution.

Henry the second, born at Paris in 1528, and succeeding his father Robert on his death in 1559, was repeatedly called before the council, reprimanded, ordered to print cancels, and excommunicated. Though Henry possessed the same literary industry and ability as his father, he was unfortunately deficient in his father's practical turn of mind. Devoted to his art and to his calling, he seems to have been utterly wanting in worldly prudence. In two years we find that he had revised and published more than 4000 pages of Greek text; while at the same time he was writing his *Apologia pro Herodoto*, a work of formidable length and learning. Rendered nervous and irritable by an overworked brain, and by pecuniary difficulties, which were gathering fast around him, the petty surveillance and censorship of the pious pastors of Geneva became intolerable to him. Travelling, originally undertaken from literary curiosity, grew into a necessity of life. In 1578, he visited Paris, where for several years he became a hanger-on of the court of Henry III., who bestowed upon him a pension, which the state of the royal exchequer rendered merely a nominal one. Quitting Paris, he wandered in poverty over Europe, his own family often ignorant of where he was to be found. He died at Lyon in 1598. Great as a publisher and commentator, Henry S. does not seem to have possessed much power as an original thinker. His mastery of Greek seems to have been almost complete, and as a critic of the French language he is still esteemed in France.—See *Caractères et Portraits Littéraires du Siècle XVI*ᵉ., by M. Leon Feugère (Paris, 1864); also article in *Quarterly Review* (Lond., April 1865); and article 'Estienne,' in the *Nouvelle Biographie Générale*.

STEPHENSON, George, was born on the 9th of June 1781, in circumstances of great poverty, his father having to maintain a family of six children on 12*s*. per week, earned by tending a colliery-engine at Wylam, near Newcastle. George's first employment was herding cows at 2*d*. per day, from which he was promoted to hoeing turnips at 4*d*.; subsequently, he was appointed fireman at Midmill Colliery, and at 15 we find him rejoicing on his salary being raised to 12*s*. a week. As fireman, he applied himself to diligent study of the steam-engine, taking his machine to pieces during his leisure hours, and thus gaining a thorough practical knowledge of it. At Black Callerton Colliery, in 1801, by dint of mending shoes and cleaning watches, in addition to his regular employment, S. contrived to save his first guinea. At 21, he had saved as much as enabled him to furnish a cottage in a humble way, and on 28th November 1802, he was married to a young woman named Fanny Henderson. She died in 1804, while her husband was brakesman at Killingworth Colliery. The early life of S. presents a record, whose interest cannot be surpassed, of a contest between determined purpose, industry, and sagacity on the one hand, against poverty on the other. Slowly, inch by inch, we find the inward forces gaining ground upon the outward. Out of his humble gains he contrived to pay 4*d*. a week for lessons in reading, writing, and arithmetic, which were conned over at night, and mastered by the light of his engine-fire. On one occasion, indeed, so hard had the tide gone against him, that even he had nearly given way to despair. 'I wept bitterly,' he says, in allusion to an intention he had formed of emigrating—'for I knew not where my lot in life might be cast.' In 1815, the invention of a colliery safety-lamp, the 'Geordie,' brought his name before the public. The fact of his invention being almost simultaneous with that of Sir H. Davy, gave rise to a long controversy between their respective friends and supporters. In 1819, S. married his second wife, Elizabeth Hindmarsh, the daughter of a farmer at Black Callerton. It was at Killingworth Colliery that he constructed his first locomotive. At first, it was not very efficient; but, subsequently, the grand improvement of the 'steam-blast' carried his experiment to a triumphant issue. Further improvements followed, and in 1821 S. was appointed engineer for the construction of the Stockton and Darlington Railway; the line, on its completion, being partially worked by means of his great invention. The rapid growth of the trade of South Lancashire, together with the unpopular management of the Bridgewater Canal, gave rise, in 1821, to the project of a railway between Liverpool and Manchester. S. was chosen engineer. That he proposed to work the line with an engine which was to go at the rate of 12 miles an hour, was a fact held up as of itself sufficient to stamp the project as a bubble. 'Twelve miles an hour!' exclaimed the *Quarterly Review*—'as well trust one's self to be fired off on a Congreve rocket.'

When the bill ultimately passed, on 16th March 1826, S. was appointed principal engineer, with a salary of £1000 a year. After inconceivable difficulties, the line was completed in 1829. There then ensued the memorable competition of engines, resulting in the complete triumph of Mr S.'s 'Rocket,' which, to the astonishment of every one except himself, was found capable of travelling at the till then undreamt-of rate of 35 miles an hour. 'Now,' exclaimed one of the directors, 'George Stephenson has at last delivered himself.' While occupied in carrying out the vast system of railway which soon overspread the country, S.'s home was at Alton Grange, near Leicester. He saw but little of it, however, as he was often travelling on business for weeks at a time. During the three years ending 1837, he was principal engineer on the North Midland, York and North Midland, Manchester and Leeds, Birmingham and Derby, and Sheffield and Rotherham Railways. In 1836 alone, 214 miles of railway were put under his direction, involving a capital of five millions. He has been known to dictate reports and letters for twelve continuous

hours. But in the midst of his immense business, his heart remained as youthful as ever. In spring, he would snatch a day for bird-nesting or gardening; in autumn, nutting was still a favourite recreation. We find him even at this time writing a touching account to his son of a pair of robins. Strong as he had shewn himself when the world was all against him, he was not less so in the midst of his success. During the railway mania, his offices in London were crowded every day with men of every rank and condition, eager to strengthen their prospectuses by the weight of his name. Where he disapproved—and at this time he almost always did disapprove—he invariably declined, though by acceding he might have made enormous gain; but to make money without labour or honour had no charm for Stephenson. In the autumn of 1845, he visited Belgium and Spain for professional purposes. On his way home he was seized with pleurisy, from which attack he does not seem ever to have thoroughly recovered. He occupied his declining years with the quiet pursuits of a country gentleman, indulging his love of nature, which, through all his busy life, had never left him. He died at his country-seat of Tapton on 12th August 1848. The leading feature of his mind was honesty of purpose, and determination in carrying it out. 'I have fought for the locomotive single-handed for nearly twenty years,' he says; 'I put up with every rebuff, determined not to be put down.' Towards trickery and affectation he never concealed his contempt, while honest merit never appealed to his liberality in vain.—See *Lives of Engineers*, by Samuel Smiles, vol. iii. (Lond. 1862).

STEPHENSON, Robert, only son of George Stephenson, was born on the 16th October 1803. When a boy, he attended a school in Newcastle. In 1820, his father's improving circumstances enabled him to send Robert to the university of Edinburgh, where he seems to have made excellent use of his time. In 1823, we find him assisting his father in the survey for the Stockton and Darlington Railway. Subsequently, he took an active part in the locomotive engine-works started by his father at Newcastle. In June 1824, he went to Mariquita, in South America, on an engineering appointment; but this not suiting him, at the end of three years he returned home by the United States and Canada. He then assumed the management of the Newcastle business. During the discussion as to the power to be employed on the Liverpool and Manchester line, he was in constant communication with his father, to whom his quick perception and rapid judgment were of great assistance. Shortly after the completion of this line, he was appointed engineer of the Leicester and Swannington Railway. Subsequently, he was appointed joint managing engineer, along with his father, of the London and Birmingham line, the execution of which immense work was ultimately almost wholly intrusted to him. In 1829, he married Frances, daughter of John Sanderson, merchant in London. She died in 1842 without issue; and he did not marry again. The London and Birmingham line was completed in such a manner as to raise S. to the very highest rank in his profession. Business now flowed in upon him. In one parliamentary session we find him engaged in 33 new schemes. Projectors thought themselves fortunate if they could procure his services on any terms. The work which he got through was enormous, and his gains large beyond what had then been known in his profession. The Britannia Tubular Bridge, of which undertaking Robert S. was the master spirit, is one of the most remarkable monuments of the enterprise and engineering skill of the present century. It was completed on 5th March 1850, at a cost of £234,450. S. lived to repeat his splendid achievement in the bridge across the St Lawrence at Montreal, and in the two bridges across the Nile at Damietta. In 1847, he was returned to the House of Commons as member for Whitby. On 15th August 1849, he completed the high-level bridge at Newcastle, and in the following year the great viaduct across the Tweed at Berwick. In 1855, the emperor of the French decorated him with the Legion of Honour. At home, the university of Oxford made him D.C.L. In the same year he was elected President of the Institute of Civil Engineers. The immense amount of work which he went through both at home and abroad proved too much for his constitution, originally delicate; while in Norway, in 1859, he was seized by the illness which soon afterwards ended his illustrious career. He died on 12th October 1859. He was buried in Westminster Abbey. It was as a workman that Robert S. was great, his political views being at times rather narrow. Contrasting him with his great rival Brunel, it has been said that the ambition of the latter was to make a great work, that of the former to make a work which would *pay*. Robert S. inherited the kindly spirit and benevolent disposition of his father. He almost worshipped his father's memory, and was ever ready to attribute to him the chief merit of his own achievements. —See *Lives of the Engineers*, by S. Smiles, vol. iii. (Lond. 1862).

STEPPES, the distinctive name applied to those extensive plains which, with the occasional interpolation of low ranges of hills, stretch from the Dnieper across the south-east of European Russia, round the shores of the Caspian and Aral Seas, between the Altai and Ural chains, and occupy the low lands of Siberia. The word, which is of Russian origin, denotes primarily an uncultivated plain of great extent, and has been applied by geographers to the above-mentioned regions as expressive of their flat, semi-barren, treeless character. In spring and early summer, the steppes are clad with a thin covering of green herbage, become parched and barren under the scorching heat and drought of June, and in winter are hid beneath a thick covering of snow, which, raised in huge white thin clouds, and driven hither and thither by furious storms, brings destruction to every living creature within its sweep. The monotony of the steppe is as fatiguing to the traveller as is that of the sandy, arid desert: for hundreds of leagues his eye is compelled to endure the same unvarying level of scanty herbage, unbroken by tree or bush, and bounded by the utmost limits of the horizon; only in spring, while the vegetation is succulent and fitted for pasture, is the solitude broken here and there by herds of horses and cattle, and their mounted guardians. In autumn, when the tall herbage, withered by the heats of summer, has been rooted up and broken by violent winds, it becomes gathered and rolled together into enormous balls, sometimes of from nine to eleven yards in diameter. Here and there are tracts which offer some inducement to the agriculturist; such are the steppe east of the Dnieper, that between the Don and Volga—of inferior fertility, but rich in coal—and the steppes of South-western Siberia, especially those in the government of Tomsk, all of which have been partially colonised; but a very wide extent is hopelessly barren.

STERCULIA'CEÆ, a natural order of exogenous plants, closely allied to *Malvaceæ* and *Byttneriaceæ*, and consisting of large trees and shrubs, natives of warm climates. About 130

species are known. The flowers of some are irregular; and in some they are hermaphrodite, in others unisexual. Many species, particularly of the suborder *Bombaceæ*, are trees of gigantic size, amongst which is the Baobab or *Adansonia* (q. v.) *digitata.* The bark of some species is very fibrous, so that it is made into ropes and coarse cloth. The light wood of *Ochroma lagopus* is used in the West Indies instead of cork. *Sterculia fœtida*, an Indian tree, with excessively fetid flowers, has pale wood, which is very durable, and susceptible of a high polish. Spars of this wood are called *Poon Spars.* The seeds of some species, as of the Silk-cotton (q. v.) trees, are surrounded with silky hairs. The seeds of all the species are oleaginous; those of some are eatable, as those of the CHICHA (*Sterculia chicha* and *S. lasiantha*) of Brazil, which are about the size of a

Chicha (*Sterculia chicha*):
a branch with leaves and flowers; *b*, parts of fructification; *c*, pistil; *d*, transverse section of ovary.

pigeon's egg, and have a pleasant flavour. They are roasted before being eaten. The Cola (q. v.) Nut of Africa is the seed of a *Sterculia.* The whole order agrees with *Malvaceæ* in possessing mucilaginous and demulcent properties. The Gum Tragacanth (q. v.) of Senegal and Sierra Leone is produced by a *Sterculia.* The Durian (q. v.) is the fruit of a tree of this order.

STERE (Gr. *stereos*, solid), the name given to the unit of cubic measure in the French metrical system. It is a cubic *mètre* (q. v.), and equivalent to 35·3165818168 English cubic feet, or 1·3080215487 English cubic yards. The *decastère* is equal to 10 steres, and the *decistère* to the tenth part of a stere. This measure is much used for wood, especially firewood.

STERELMI'NTHA (Gr. *stereos*, solid, and *helmins*, an intestinal worm), a term suggested by Professor Owen, and generally adopted to signify those intestinal worms which have no true abdominal cavity, and which were called 'parenchymatous' by Cuvier. See CŒLELMINTHA.

STE'REOCHROMY, a new process of wall-painting, invented by Professor J. N. von Fuchs, of Munich, which he professes to be superior to fresco-painting, inasmuch as it will admit of any part of the picture being retouched, as in the case of oil-paintings, and is more durable, being protected by a varnish from the effects of the atmosphere.

STE'REOSCOPE (Gr. *stereos*, solid, and *skopein*, to see), an optical instrument of modern invention, by means of which pictures of objects possessing three dimensions, are seen not as plane representations, but with an appearance of solidity or relief, as in ordinary vision of the objects themselves. The more recondite principles of the stereoscope, which are of high interest and importance in their bearing on the philosophy of perception, will be fully considered under VISION, BINOCULAR. The present article will be limited to an historical sketch of its invention and subsequent developments, coupled with an exposition of the optical and mechanical details of its construction.

The essential principle of the stereoscope, the first conception of which by Professor Wheatstone justly ranks as one of the most brilliant optical discoveries of the age, may be thus explained. It is an obvious fact that the eyes being separated by a certain interval of space, all solid objects so near to the observer as to be seen with a sensible convergence of the optic axes, necessarily form retinal pictures, differing as to their perspective projections for each eye. Singular to say, the true import of this plain fact was wholly unsuspected prior to the investigations of Professor Wheatstone, who, in his first paper on this subject, published in the *Philosophical Transactions* for 1838, clearly established the important conclusion, that this dissimilarity of the retinal images is made to subserve an important end in the use of our visual organs—that it is, in fact, the principal originating cause of our immediate perception of the solidity (or relief) of objects adjacent to the sight. The problem he set himself to investigate was: 'What would be the visual effect of simultaneously presenting to each eye, instead of the object itself, its projection on a plane surface as it appears to that eye?' and in order to bring this question to the test of experiment, he devised an instrument which he named the stereoscope, and which, with certain additions more recently proposed by the same author, is shewn in fig. 1.

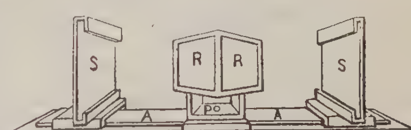


Fig. 1.

RR, two square mirrors about three inches in diameter, fixed vertically with their backs at a right angle with each other; SS, slides for the reception of the pictures, the *left*-hand picture being placed in the *right*-hand slide, and *vice versâ*, on account of the lateral inversion of their reflected images. SS are made to slide along the arms AA, so that their distance from RR may be varied at pleasure. SS also revolve each on a vertical axis, to admit of the variation of their angular position with reference to the arms AA. AA may also be moved in a horizontal plane, on the common pivot P.

The pictures being attached to the slides, the observer places himself with his nose close to, and immediately in front of, the vertical angle made by the reflectors, so that the view by each eye is limited to the rays reflected by its appropriate mirror; the pictures are then seen, as it were, behind the mirrors, and the eyes being made slightly to converge, either by an effort of the will, or by drawing the slides, SS, a little forward, the effect of either of which is to refer the reflected images to the same part of space, the observer sees no longer mere pictorial resemblances, but, to all appearance, the objects themselves, exquisitely modelled, occupying a certain extent of space, and standing forth with a substantiality of aspect truly wonderful. At the outset, the only stereoscopic pictures obtainable were the outlines of geometrical solid figures, which it was possible for a skilful artist to depict

with perspective projections adapted for the right and left eye respectively; and the pictures so prepared excited the greatest interest and admiration. They, moreover, abundantly exemplified the truth and importance of the binocular principle, though the universality of its application to purposes of pictorial illustration only became apparent on the introduction and gradual improvement of the photographic arts. In 1849, Sir David Brewster originated that convenient, portable, and in all respects admirable form of the stereoscope which is now in general use over the whole civilised world. For this—the lenticular stereoscope—the pictures (taken, be it remembered, from two different points of view) are mounted side by side, on a piece of cardboard, and, being placed in the instrument, are viewed through semi-lenses, fixed at the distance apart of the two eyes. To effect the displacement of the pictures, so that they shall be referred to the same part of space, which we have above defined to be an essential condition, Sir David Brewster most ingeniously availed himself of an optical principle, which enabled him at the same time to fulfil several collateral ends of considerable importance. This principle may be described as follows: If an object be viewed through the centre, or, more properly, along the axis, of a convex lens, it will be seen exactly in front of the eye; i. e., in a line with the eye, the centre of the lens, and the actual place of the object. If now the lens be moved slightly to the left, the object will appear to advance towards the right; and, conversely, as the lens is moved towards the right, the object is displaced in the opposite direction. Let the lens be cut in half, transversely, and the two semi-circular pieces reversed as to their former position, i. e., placed side by side, and so that their thin edges shall be adjacent, while the two plane edges, formed by the section of the lens, are kept in mutual parallelism, and have their faces turned outwards, towards the left and right respectively: the right eye will now look through the left half of the lens, and *vice versâ;* and the two pictures, each placed opposite its appropriate eye, and in the principal focus of the eye-piece, will be seen, not in their actual places, but in a position midway between the two. The subsidiary purposes served by this arrangement are, that the pictures are magnified as well as caused to coalesce; and that the equality of the magnifying power of the eye-pieces (a result by no other means certainly attainable) is secured by the fact of their being cut from the same lens, the whole of which is thus advantageously and economically utilised. In too many of the instruments offered for sale, the conditions stated above are very imperfectly fulfilled; the parallelism of the two sectional planes of the semi-lenses, and their rectangularity with two imaginary planes joining their opposite ends respectively, are not maintained, and as a consequence, the coalescence of the pictures is effected, if at all, by a forced and more or less painful displacement of the eye-balls, entirely destructive of all pleasure in the use of the instrument. And it is important to recollect that this parallelism of the sides of the semi-lenses may be either actual or virtual; for to whatever shape they may be cut (and the circular form is the one most often adopted), the foregoing conditions are in no wise altered. The best lenticular form of the instrument with which we are acquainted, is the achromatic stereoscope devised by Messrs Smith, Beck, and Beck, the well-known London opticians, which combines excellencies of a very varied character. Its construction is shewn in fig. 2.

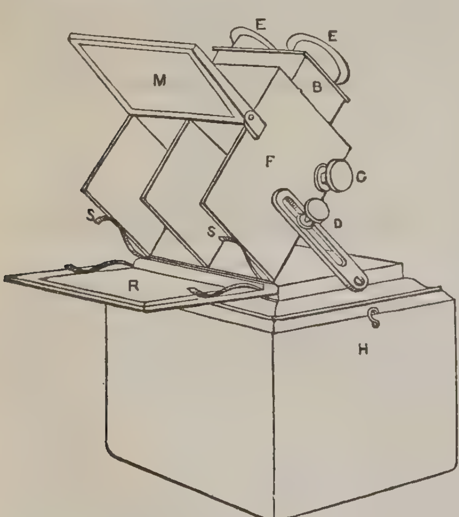


Fig. 2.

EE, the eye-pieces fitted to the sliding-box, B, which, by means of the milled head, C, attached to a rack-and-pinion movement, can be moved out or in for adjusting the focus. D, a slot and screw for fixing the body of the stereoscope, F, at any desired inclination; M, a mirror for reflecting light upon the picture, which is inserted between the springs, SS, and the woodwork of the stereoscope, and is thus firmly held. For viewing transparencies, the flap containing M is closed, and the picture illuminated by light reflected through it by the mirror, R, the inclination of which is adjustable at pleasure; H is a box forming a convenient receptacle for the whole of the instrument.

It remains to speak of the pictures in their relation the one to the other as a stereoscopic pair. Evidently, exactly to reproduce the conditions of normal vision, they should be taken from points of view separated laterally by a space equal to the distance between the eyes, viz., about 2½ inches; and for all objects within narrow limits of distance this rule is observed. But taking a wider range, such as would include, for instance, an extensive architectural pile, photographers usually take their pictures from spots separated by a considerable interval; and the stereoscopic slides thus obtained, when viewed in the stereoscope, exhibit effects of solidity or relief of a very striking character. Inasmuch, however, as these effects are due to a gross exaggeration of the ordinary difference of perspective relatively to the two eyes, they to a like extent misrepresent the actual appearance of the scene; and it were to be wished that for all stereoscopic pairs alike, whether representative of near or of remote objects, photographers would be content to adopt that exact relation of the two retinal pictures which subsists in ordinary binocular vision. As to the mounting of the pictures, it is of course highly important that they be placed exactly in the same line; it has further been pointed out by Mr Claudet that, as the apparent solidity of the objects viewed in the stereoscope conflicts with the evident flatness of the cardboard mount, it is advantageous to adopt the following expedient. The pictures must be of the same size, but instead of having them identically the same as regards the objects represented on each, let the left-hand picture include on its left-hand margin somewhat less than is found on the same margin of the right-hand picture; similarly, let its right-hand margin contain somewhat more than is found on the same margin of the right-hand picture: then will the view appear to extend well out of and beyond the cardboard, which forms, as it were, a framework

around it. A moment's consideration will shew that this ingenious arrangement does but reproduce the conditions which obtain whenever we look out upon a scene through a casement distant from us by a few feet. Availing himself of the libration of the moon, Mr Warren De La Rue has obtained lunar stereoscopic photographs, which exhibit that body with a general appearance of rotundity, while the objects on her surface are seen in conspicuous relief. These effects are, however, evidently due to an exaggeration of the 'binocular parallax;' for by no human eyes, how near soever they might be placed to the lunar surface, could such a view be obtained. It is, as Sir John Herschel has remarked, as though the moon were seen with the eyes of a giant, placed thousands of miles apart.

Among the minor applications of the stereoscope, may be mentioned the STEREOMONOSCOPE and the STEREOTROPE, the former devised by Mr Claudet, the latter by Mr William Thomas Shaw; and severally described by them in the *Proceedings of the Royal Society* of June 1857, April 1858, and January 1861. In the stereomonoscope, the two pictures of a stereoscopic pair are projected, by means of lenses, on to the posterior surface of a piece of ground glass, one upon the other, or so that they occupy the same place; when the observer, looking from the opposite side of the glass, sees them not as a confused mixture of two pictures, but as a single stereoscopic representation, possessing the usual attributes of solidity or relief. The stereotrope consists in an application of the principle of the stereoscope to that class of instruments variously termed thaumatropes, phenakistoscopes, &c., which depend for their results on 'persistence of vision.' In these instruments, as is well known, an object represented on a revolving disc in the successive positions it assumes in performing a given evolution, is seen to execute the movement so delineated; in the stereotrope, the effect of solidity is superadded, so that the object is seen as if in motion, and with an appearance of relief as in nature. A highly ingenious application of the principle of the stereoscope to portraiture has been described by Mr Henry Swann in the *Report of the British Association* for 1863. In this arrangement, the portrait is seen as a solid bust embedded in a cube of crystal. A form of the reflecting stereoscope, in which the planes of reflection are vertical, has been proposed by Mr Walter Hardie.

But by far the most important application of the stereoscopic principle, is its realisation in the binocular microscope of Mr Wenham, the advantages of which over the monocular form of that instrument are increasingly appreciated by microscopists. In this, the right and left eye pictures, respectively, are thus obtained. Immediately behind the object-glass, a small and peculiarly shaped prism is placed in such a position, that it shall receive the whole of the rays coming through the right half of the lens. These rays, after being twice reflected within the body of the prism, finally emerge at such an angle to their original direction, that they cross the undiverted pencil of rays transmitted by the other half of the lens, and are then received into a second tube, which, being inclined to the first or main tube at an appropriate angle, conveys them to the left eye; while the other complement of rays pursues an undeviating course to the right eye. Each of the two tubes is fitted with the usual eye-pieces; and object-glasses of all but the highest powers may be used with pleasure and advantage. For a fuller explanation, see the original paper by Mr Wenham in the *Transactions of the Microscopic Society*, new series, vol. ix., page 15.

STE'REOTYPING (Gr. *stereos*, fixed, solid), the art of fabricating metal plates resembling pages of type, from which impressions may be taken as in ordinary letterpress-printing. The plates, which are composed of type-metal, are about three-sixteenths of an inch thick, perfectly smooth on the back, and having a face exactly resembling a page of movable type. To yield an impression, the plates are fastened by a temporary arrangement to blocks of wood—plate and block together being the height of a type, or one inch. Stereotyping is not employed where only a definite and moderate number of impressions of any work are required. Its chief value consists in its availableness for future impressions contingent on the renewed demand for copies; but it is also of importance in duplicating the means of taking large impressions quickly. Considering the small quantity of metal employed in fabricating a stereotype plate, printers are enabled to secure and store up forms of type, so to speak, at a comparatively small outlay, and have at all times the means ready at hand to produce fresh editions without the trouble or cost of setting a single letter. As in the case of many valuable inventions, there has been not a little discussion as to who was the discoverer of the art of stereotyping. By some it has been ascribed to Van der Mey, a Dutch printer, who early in the 18th c. executed editions of the Bible from forms of fixed type. Van der Mey's process, however, was not stereotyping in the proper sense of the word; for it consisted in nothing more than soldering together all the types in a page in order to fix them permanently. There can be no doubt that the inventor of stereotyping was William Ged, a goldsmith in Edinburgh, who made the discovery about 1725. In 1727, he entered into a contract with a person to prosecute the business of stereotyping; but this person, who had little means, becoming intimidated, the contract was relinquished. In 1729, Ged entered into a partnership for the same object with William Fenner, a London stationer. Afterwards, John James, an architect, Thomas James, a typefounder, and James Ged, son of the inventor, joined the partnership. By this association, certain Bibles and Prayer-books were stereotyped for the university of Cambridge about 1731. Ged's success was so far complete, but his prospects were blighted by ill-treatment from his partners, as well as by the misconduct of the pressmen employed to print from his plates, which they maliciously damaged and rendered imperfect. The university appears to have at length abandoned the use of the plates, which were sent to Caslon's letter-foundry in London to be melted. A few of these plates escaped the crucible, and from two of them, being pages of the Book of Common Prayer, impressions are given in Hansard's *Typographia*, Part II. (1825). Ged's partnership was broken up in 1738, and full of disappointment he returned to Edinburgh. There, he prosecuted his art, and was able to execute several editions of Sallust, of a small size, for the use of schools. Copies of these editions still exist. The earliest which we have seen purports to be printed in 1739, and bears an imprint in Latin which may be translated as follows: 'Not executed by movable types, but by tablets of fused metal.' The printing is as neatly executed as that of any volume at the period. This Sallust of 1739, as we apprehend, was the first book correctly printed from stereotype plates. To add to the cares of William Ged, his son James engaged in the Jacobite insurrection of 1745, and was taken prisoner, and condemned; his life, however, was spared on account of his father's useful invention, and he proceeded to Jamaica, where William, his

brother, was already settled. William Ged, the inventor of stereotyping, died at Edinburgh, October 19, 1749, in very indifferent circumstances.

The art of stereotyping has undergone little change since its discovery by Ged. The process of fabricating plates is very simple. The page of type being set, corrected, cleaned, and fixed in a frame, is laid on a smooth iron table, face upward; a little fine oil is brushed over it, to prevent the liquid stucco from adhering; the stucco to the consistency of cream is now poured over the face of the page, and straightened over it in the process of hardening; when hardened, the cake of stucco is lifted off, and is seen to be a perfect mould of the types. The cake is now baked in an oven and then placed in an iron pan; the pan, which has inlets at the upper side, is plunged into molten metal, which soon runs into the mould; being lifted out and cooled, the pan is opened and found to contain a plate resembling the page of type; the mould is broken and of no further use. When removed from the pan, the plate is rough, and needs to be trimmed for working; for this purpose, it passes through the hands of artisans, who prepare it for the press. Should any particular letter be defective, it is dug out, and a corresponding type inserted; the end of which type is cut off at the back of the plate by a soldering bolt. In preparing plates for press, nothing is more important than giving a high degree of level smoothness to the back, and to effect this certain planing and smoothing operations are adopted. Such is the old and well-known *stucco* process of stereotyping. Latterly, there have been divers improvements as regards the shape of the pans, in order to facilitate the fabrication of several plates at once, but the principle is in all cases the same. After the stereotyping is finished, the types are distributed. In some printing-offices, all work whatsoever is executed from plates, and types are employed only to produce moulds. This however, does not save types from deterioration; in cleaning them with brushes and oiling them for the stucco, their finer parts become in no long time rounded off. As regards impressions from stereotype plates, the work is seldom so sharp and fine as from pages of movable letter; but it answers every required purpose in a large variety of cases. Plates properly manufactured, stored, and mended when necessary, will last for repeated impressions to the extent of hundreds of thousands over a long series of years. The stock of plates in some establishments is accordingly large, and represents a considerable sunk capital. When no longer required, the plates are melted down as material for fresh castings.

The *paper* process of stereotyping was invented some years ago on the continent, but has been since perfected in the *Times* office, where it was adopted for duplicating newspaper forms. See TIMES. A uniform sheet of soft and damp matter is formed by gumming together, first, a sheet of thin yet very tough tissue paper; second, a sheet of loose and bibulous white paper; and third, a sheet of fine-grained and tough brown paper. The smooth and white side of the sheet, still soft and moist, is placed on the types. Both are then put in a press. A roller passes under the form, and presses it up against the paper, so as to receive the impression of the types and convert it into a mould. The dents made by the types rise on the outside of the paper, so that any spot where the paper has not sunk into the spaces between the types is at once detected. Such spots generally occur, and are removed by the paper being driven in between the types by blows of a hard brush. The dents made by the types, we have said, are represented by elevations on the outside of the sheet and the interstices are represented by corresponding hollows. The latter are filled up at this stage by a thin coating of stucco laid on by a brush. The mould is then carefully removed, dried, and placed in a shallow box of metal placed upright. The smooth or stucco side of the mould is pushed against the back of the box. The lid is then closed very tightly, leaving only an opening at the top. Through this opening molten metal is poured, and a plate is thus formed, one side of which, of course, is a cast from the mould. It contains elevations at places where there are wide spaces between the types, and these it is necessary to remove with the chisel. In other respects the plate is an exact copy of the form. The great advantage of this mode of stereotyping is its rapidity. Plates from stucco could scarcely be produced and ready for press in less than six hours; plates from paper can be produced and laid on the machine in less than one hour. Indeed, in the *Times* office, where the process has been carried to great perfection, the plates are now produced in seven minutes. By the paper process, plates are produced every morning for the London newspapers and others of which vast impressions are required. The forms of types themselves are no longer used, a number of plates being produced corresponding to the number of machines employed (see TIMES), and all the copies of the paper are printed from them. A very great saving in the cost of types is thus effected. It was necessary to renew the fount every few months in the *Times* office, when that paper was printed in the usual way. Since the introduction of the new process, however, no new types have been required. They seem as yet not in the least injured, and will certainly last as many years as they did months when printed from. To accommodate printing machines on which the forms need to be fixed in a cylinder, the paper moulds are placed in pans or boxes which are of the required shape. The moulds are then bent with their backs outwards, and the molten metal is poured between the concave mould and convex lid. The plates are generally cast in four segments, which screwed together form a cylinder. They are adjusted to the printing press by a planing machine, which cuts their inner surface to the exact convexity of the cylinder. To this duplication there is of course no limit; sets of plates can be produced to any required number. As copies of old newspapers are not wanted, the plates are melted down as soon as the operations of the day are over. Even when books are printed from movable types, it may serve a good purpose to take paper moulds from them before distribution; for the moulds, on being dried, can be laid aside and be afterwards employed for fabricating plates should a new impression be wanted. The author of a book, for example, could at a most insignificant addition to the expense of typography, possess himself of a set of paper moulds of his work, to be used if necessary at some future period, in order to save the composition for a new edition. W. C.

STE'RLET. See STURGEON.

STE'RLING, an epithet generally applied to the money of the United Kingdom. The original standard of money was weight, and among the Anglo-Saxon and Teutonic nations the basis of weight was in early times supplied by the wheat-corn. Charlemagne superseded the earlier systems by a new coinage, in which a pound of 12 ounces became the money-weight, each pound being divided into 20 solidi, and each solidus into 12 denarii of the weight of 32 wheat-corns. The older *silver* o.

scruple of 24 wheat-corns being superseded by the penny of 32 wheat-corns, the term sterling seems to have been applied to the latter, in consequence of its being in use among the Ripuarian or Austrasian Franks, sometimes called the *Esterlings*, while the old scruple continued to be used by the Northmen. In England, where the change was early introduced, the word sterling came in the course of time to indicate the fineness or standard of the silver; and nearly the same standard, consisting of 11 oz. 2 dwt. of pure silver, and 18 dwt. of alloy to the pound troy, or $\frac{18}{222}$dwt., seems to have subsisted from the 12th c. downwards. The superiority of the English standard silver to all other currency has been generally acknowledged over Europe; and hence the adjective sterling has become a synonym for pure and genuine.

STERNBERG, a town of Austria, in Moravia, 12 miles north-north-east of Olmütz. Pop. 13,500. It is the chief seat of the Moravian cotton manufactures, and has also not unimportant manufactures of linen, hosiery, and liqueurs. The cotton and linen goods made at S., and in the vicinity, are known as *S. wares.*

STERNE, Laurence, though of English descent and parentage, was born at Clonmel, in Ireland, on 24th November 1713. In that country also, in some intermittent way, a good deal of his boyhood was passed, with possibly some effect in developing that oddity and whimsical exuberance long after to find vent in his writings. His father was of a good Yorkshire family, and as lieutenant in a marching regiment led a wandering and unsettled life. When about ten years old, the boy was consigned to the care of his kinsman, Mr Sterne of Elvington, in Yorkshire, by him put to school near Halifax, and thence, on his approving himself a lad of parts, transferred, in 1733, to Jesus College, Cambridge, where, in 1736 and 1740 respectively, he took the degrees of Bachelor and Master of Arts. He was educated for the church, and on his leaving the university, his uncle the Rev. Jaques Sterne, an ecclesiastical dignitary of some magnitude, procured for him the living of Sutton in Yorkshire. With this relative he afterwards quarrelled, but not before another appointment had been secured him as Prebendary of York cathedral. In 1741, he was married to a lady whom he met in York, and soon after, through the influence of a friend of his wife, he was presented to the additional living of Stillington. For nearly 20 years he lived at Sutton unheard of. That his devotion to his clerical duties was great, is more than can be supposed from what we know of his character; and we can readily believe the 'books, painting, fiddling, and shooting,' which he tells us were his choice recreations, formed pretty much the business of his life. Up to the year 1759, in which the first two volumes of his *Tristram Shandy* appeared, he had published only two sermons, which according to his own statement, 'found neither purchasers nor readers.' *Tristram Shandy*, which, though published without his name, was from the first known to be his, had instant and immense success, and S., on going up to London, found himself the literary lion of the day. In 1761, two more volumes of it appeared, followed by vols. 5 and 6 in 1762, vols. 7 and 8 in 1765, and in 1767 by the 9th and last. During this period he also issued 4 vols. of sermons, and the *Sentimental Journey*, published in the beginning of 1768, completes the list of his works. He died on 18th March of that year, his health having been much impaired for some considerable time.

From the time of his becoming famous his parishioners saw of S. but little. He lived mostly either on the continent or in London, where his literary celebrity made him welcome in the best circles. Always an easy, mercurial kind of mortal, he now led a somewhat gay and dissipated life, rather modelled on the Epicurean maxim of enjoying the present hour, than on those more serious precepts he had been wont to enforce from the pulpit. But except that he does not seem to have been excessively devoted to his own wife—she and her daughter being in these pleasant years but little with him—and was a little of a sentimental Lothario in respect of the wives of other people, no very great harm is known of him. He is said, despite of the exquisite sentiment which abounds in his writings, to have been really heartless and unfeeling; and the sneer of Walpole, that he could snivel over a dead ass, to the neglect of his live mother, is familiar to almost every one. It is in fairness, however, to be said that the implied slander rests on no distinct basis of evidence.

Whatever question may be made of the worth of S. as a man, there can be none of his genius as a writer. *Tristram Shandy*, his chief work, must live as long as the language, were it only in virtue of the three characters of Old Shandy, Uncle Toby, and Trim, the most perfect and exquisite, perhaps, in the whole range of British fiction. These are genuine creations, at once fantastic and real, in which the subtlest reconcilement is effected between the sportive exuberance of fancy and the sober outlines of truth. Otherwise there is a good deal in the work which needs excuse; in particular, a most wilful and gratuitous indecency almost without a parallel, and a constant trick of lawless and whimsical digression, to the endless incalculable frivolities of which even the inimitable grace, ease, and tricksy flexibility of the style can with difficulty reconcile the reader. The humour of S. is notwithstanding the most subtle, airy, delicate, and tender to be found in our literature; and in many passages he shews himself master of a pathos equally exquisite and refined. The fullest and, in every way, best account of S. will be found in his Life, in two volumes, by Mr Percy Fitzgerald, published in 1864. Though against the charge of unclerical levity, at once in his writings and his life, it is impossible to defend S., except as the laxer *morale* of his time may afford some slight palliation of it, a candid perusal of this work suggests a considerably more kindly view of his character than that which had previously been current and almost accepted.

STERNHOLD, Thomas, one of the authors of the English version of psalms formerly attached to the Book of Common Prayer, was a native of Hampshire, and born towards the close of the 15th century. He held the office of Groom of the Robes to Henry VIII. and Edward VI., and died in 1549. At the Reformation period, when the practice of singing metrical psalms—first introduced by Clement Marot among the gay courtiers of Francis I.—came to be taken up by the Reformers, S. undertook to render the whole book of Psalms into English verse. He only lived to complete twenty-one psalms; and his version was published after his death under the title of *All such Psalm of David as Thomas Sternhold did in his Lyfe drawe into English metre* (Lond. 1549). S.'s labours were completed by John Hopkins and William Whittinghame, and first annexed to the Book of Common Prayer with the music attached, as *The Whole Booke of Psalmes, collected into English metre by Thomas Sternhold, John Hopkins, and others; compared with the Ebrue, with Notes to sing withal.* S. and Hopkins's psalms are very literal, but somewhat coarse and homely in phraseology. They were used in the church service of England till superseded by the version of Tate and Brady

which appeared in 1698. They were also in use in Scotland down to the middle of the 17th century.

STE'RNIDÆ. See Tern.

STE'RNUTORIES are agents which cause sneezing. The most common are the different kinds of snuffs, but other substances are known which produce a more powerful and prolonged action on the nasal mucous membrane. They have been employed in medicine with various objects; as, for example, to restore suspended respiration in case of fainting, to dislodge foreign bodies from the nasal passages or even the windpipe, to avert or check hysterical attacks, and to terminate prolonged fits of hiccup. They are scarcely ever used at the present day.

STE'THOSCOPE, The (Gr. *stethos*, the chest, and *skopeo*, I look into), is an instrument invented by Laennec for examining the sounds of the chest. Its form will be best understood by the figure, which represents the section reduced to half the natural diameter, or one-eighth of the actual size. The upper part is the chest end, the lower the ear-piece. The most convenient measurements are—length, 7 inches; diameter of the ear-piece, 3 inches; circumference of shaft, 1¼ inch, and diameter of chest end, 1¼ inch. The main object of the stethoscope being to circumscribe and localise the sounds which it transmits, the chest end should be small, in order to determine the exact seat of the greatest intensity of sound. To ascertain this, the instrument should be moved right and left, up and down, till its end is on the exact spot from which the abnormal sound for which we are searching—or, it may be, the absence of sound—proceeds. In the construction of the stethoscope, the following points should be attended to: 1. It should be composed of a material which allows the least amount of sound to be lost, and which least of all modifies or prevents the sound. A porous wood, such as cedar or deal, answers these conditions best, a dense wood, like ebony, having a tendency to modify the sound; 2. It should be of one piece of wood, and not, for example, part ivory and part cedar; 3. The ear-piece should be large and flat to secure perfect apposition and occlusion, and the chest end should be narrow and smoothly rounded over the edge. The various sounds heard through the stethoscope are described in the articles Respiratory Sounds, Pneumonia, &c.

Stethoscope.

STETTI'N, a fortified town of Prussia, capital of the province of Pomerania (*Pommern*), and, after Danzig, the most important sea-port in the kingdom, is situated on the left bank of the Oder, where it flows into the Stettiner-Haff, 83 miles north-east of Berlin, with which it is connected by railway. The entire population of the town in 1880 was 91,745. Across the river, which is here from 12 to 16 feet deep, lies the suburb of Lastadie, connected with S. proper by means of two bridges. Outside the fortifications lie the suburbs of Upper and Lower Wieck and Tornei. The site of the town is hilly, and in consequence the streets are uneven, but the houses are good and the environs very pleasant. The principal buildings are the castle or fortress, the government house, the 'county buildings' with a valuable library, the exchange, and theatre. The chief manufactures are silks, leather, sail cloth, cottons, &c. There is also a large anchor foundry, where all the anchors for Prussian ships are forged. Ship-building and the manufacture of machinery give employment to great numbers; and the commerce of the city is extensive and increasing. S. is the port whence the products of Silesia, both natural and artificial, are mainly shipped to other countries. Corn, wood, and brandy are the principal articles of export. S. owned (1868) 208 vessels, of which 28 were steamers. In 1867, 2214 vessels, of 200,487 lasts (1 last = $1\frac{1}{4}$ tons), arrived at the port of Stettin. The amount of grain exported in 1866 was 805,450 imperial quarters.—*Stettiner-Haff* is formed by an expansion of the River Oder north of the town of S., and is nearly quite shut in from the Baltic by the islands of Usedom and Wollin, having communication with the sea only by three narrow straits, the most important of which is the Swine. See Swinemünde. It has an area of 200 sq. m., and a depth of from 12 to 18 feet.

S., the ancient *Sedinum*, later *Stettinum*, is of Slavic origin, became a flourishing commercial town in the middle ages, joined the Hansa, and was repeatedly the residence of the Dukes of Pomerania.

STEUBEN, Frederic William Augustus, Baron, a general of the American revolutionary army, was born at Magdeburg, Prussia, November 15, 1730; educated at the Jesuits' Colleges of Niesse and Breslau; and at the age of 14 served as a volunteer under his father at the siege of Prague. In 1747 he was appointed cadet of infantry, and in 1758 had risen to the rank of adjutant-general. He was wounded in the battle of Kunersdorf, and in 1761 was conducted as a prisoner of war to St Petersburg, but was shortly after released. The following year he was appointed adjutant-general on the staff of the Prussian king, effected important reforms in the quartermaster's department, and superintended an academy of young officers selected for special military instruction. At the close of the Seven Years' War, he travelled in Europe, and was appointed Grand Marshal and General of the Guard of the Prince of Hohenzollern-Hechingen. Being on a visit to Paris in 1777, where the cause of the American rebellion was favoured by the government, he was invited by Count St Germain to go to America. He arrived at Portsmouth, Virginia, December 1, 1777, and offered his services to General Washington, which were joyfully accepted; and he joined the army, then in the most deplorable condition, at Valley Forge. He was appointed inspector-general, prepared a manual of tactics for the army, remodelled its organisation, and improved its discipline. He was one of the officers who composed the court-martial at the trial of Major André. In the campaign of 1780 he had a command in Virginia, and was on the staff of General Lafayette at the siege of Yorktown. As generous in character as he was capable as an officer, he spent his whole fortune in clothing his men, and gave his last dollar to his soldiers. Congress made tardy reparation, and in 1790 voted him an annuity of 2500 dollars, and a township of land in the state of New York, both of which he divided with his fellow-officers. He died on his estate near Utica, New York, November 28, 1794. See Sparks's *American Biography*, and a Life by Friedrich Kapp (New York, 1860).

STEVENSON, Robert, a Scotch engineer, was born at Glasgow, 8th June 1772. His father, who was a merchant connected with the West India trade, died during his infancy; and his mother having (1786) married Mr Thomas Smith, the first engineer of the Light-house Board, young S. was led to devote himself to the study of engineering,

in which his progress was so rapid that in 1791 he was intrusted by Mr Smith with the erection of a light-house on Little Cumbrae. In 1796, he succeeded his father-in-law as engineer and inspector of light-houses; and during his 47 years' tenure of that office, he planned and constructed no fewer than 23 light-houses round the Scottish coasts; employing the catoptric system of illumination, and his valuable invention of 'intermittent' and 'flashing' lights. The most remarkable of these erections was that on the Bell Rock (q. v.), for which he had been sketching plans for some time, when the wreck of the *York*, a 74-gun ship, on this reef drew general attention to the same subject. The enterprise was quite unprecedented in light-house engineering, for in the only instance at all analogous—the Eddystone Light-house—the rock was barely submerged at flood, while the Bell Rock was never uncovered except at very low ebb tides. In 1814, S. was accompanied in his tour of inspection by Sir Walter Scott, and while the former was projecting another light-house on the Skerryvore (q. v.), near Tiree, the latter was doubtless laying up ample materials for those minute descriptions of the west coast of Scotland and its islands which were afterwards embodied in the *Lord of the Isles*. S. was also in great request as a consulting engineer in the matter of roads, bridges, harbours, canals, and railways, introduced many improvements in their construction, and occasionally co-operated with Rennie, Telford, and others. He died in Edinburgh, July 12, 1850. Like most eminent practical men, S. has left few literary remains; these being merely four volumes of professional printed reports, a large work on the Bell Rock Light-house, some articles in the *Encyclopædia Britannica* and in the *Edinburgh Encyclopædia*, and a series of letters descriptive of the engineering works of the Netherlands in the *Scots Magazine* (1817).

STEVENSTON, a town of Scotland, county of Ayr, is a station on the Ardrossan and Saltcoats branch of the Glasgow and Ayr Railway, and is situated about three miles east of Ardrossan. Pop. 2704. S. consists mainly of one low, straggling, uneven, and narrow street, about half a mile in length; but the parish church is finely placed on a slight eminence, which commands a splendid view of the Arran Hills and the lower scenery of the Firth of Clyde. Cotton-weaving used to be the chief industry of the place, but its prosperity now depends almost exclusively on the collieries and ironworks in its vicinity.

STEWARD OF ENGLAND, LORD HIGH, one of the great officers of state, and anciently the first officer of the crown in England. The dignity was in early times hereditary. From Hugh Grentmesnell, Lord Steward in the time of Henry II., it passed by the marriage of his daughter and co-heir to the family of De Bellomont, Earls of Leicester, and thence also by marriage to the Montforts, Earls of Leicester. On the death and attainder of Simon de Montfort, Earl of Leicester, in 1265, the office, reverting to the crown, was granted with the earldom of Leicester to Edmund, younger son of Henry III., and continued annexed to the earldoms of Lancaster and Leicester, till absorbed into the royal dignity on the accession of Henry IV. Since that time, there has been no permanent Lord Steward, but the office is temporarily revived when occasion requires, a Lord Steward being appointed under the Great Seal *pro hac vice* at a coronation, or the trial of a peer (see PARLIAMENT). When the proceedings are at an end, the Lord Steward terminates his commission by breaking his wand of office.

STEWARD OF THE HOUSEHOLD, LORD, an officer of the royal household in England, of great antiquity, originally designated the Lord Great Master of the Household. He is the head of the ancient court called the *Board of Green Cloth*, and as such has the control of all the officers and servants of the household, except those belonging to the Chapel, the Chamber, and the Stable. The other members of the Board of Green Cloth are the treasurer and the comptroller, over whom, as well as the Master of the Household, the Lord Steward's authority extends. That court had, by 3 Hen. VII. c. 14, and 33 Hen. VIII. c. 12, authority to try and punish all treasons, misprisions, murders, manslaughters, bloodsheds, &c. in the royal palace, and within the verge of the court. But this jurisdiction, which had long fallen into disuse, was in part repealed by 9 Geo. IV. c. 31, and altogether abolished by 12 and 13 Vict. c. 101; and the functions of the Board of Green Cloth are now confined to the supervision of the household expenses and accounts, the purveyance of the provisions and their payment, and the good government of the servants of the household. The Lord Steward selects all the subordinate officers and servants, except those connected with the royal stables; he also appoints the Queen's tradesmen. He is always sworn a member of the Privy Council, and has precedence of all peers of his own degree. He has no formal grant of office, but receives his charge from the sovereign in person, who, delivering to him a white wand as his staff of office, says: '*Seneschal, tenez le bâton de notre maison.*' He holds his appointment during pleasure, and his tenure depends upon the political party to which he belongs. The salary of the office is £2000.

STEWARD or HIGH STEWARD OF SCOTLAND, an office of high dignity and power under the Scottish crown during the 12th, 13th, and 14th centuries (called in Latin *dapifer* or *seneschallus*). The High Steward not only was chief of the household, but collected and managed the crown revenues, and possessed the privilege of holding the first place in the army next to the king in battle. The office was early in the 12th c. conferred by David I. on Walter, second son of Alan, Lord of Oswestry, along with extensive territorial possessions, comprehending among others the barony of Renfrew; and the dignity of steward became hereditary in his family, who in virtue of their office assumed the surname of Stewart. The accession of Robert, the seventh High Steward, to the throne, as Robert II., merged the seneschalship in the crown; but the estates of the stewards afterwards became the appanage of the king's eldest son, and by act of the Scottish Parliament of 1469, the titles of Prince and High Steward of Scotland, Duke of Rothesay, Earl of Carrick, Baron of Renfrew, and Lord of the Isles, were vested in the eldest son and heir-apparent of the crown of Scotland for ever. 'Great Steward of Scotland' has thus become one of the titles of the Prince of Wales. See STEWART, FAMILY OF.

STEWART, THE FAMILY OF. The origin of the Stewarts, long obscured by myth, was rediscovered in the beginning of the present century by the indefatigable antiquary, George Chalmers. Alan, son of Flahald, a Norman, accompanied the Conqueror into England, and obtained by his gift the lands and castle of Oswestry in Shropshire. His eldest son, William, remaining in England, became the ancestor of the Fitzalans, Earls of Arundel, from whom the Duke of Norfolk inherits that earldom through an heiress. The second son, Walter, passing into Scotland in the service of David I.,

had large territorial possessions conferred on him by that monarch, along with the dignity of Steward of Scotland, which became hereditary in his family, and was assumed by his descendants as a surname; some branches of the House, when spelling began to be considered, modifying the orthography to Steuart, or the French form Stuart. The fess chequy adopted as the arms of the family is emblematical of the chequer of the Steward's board. The connection between the Stewarts and Fitzalans was shewn by Mr Chalmers to have been well known and acknowledged as late as 1336, when Richard Fitzalan, Earl of Arundel, sold the Stewardship of Scotland to his sovereign, Edward III., and Edward Baliol, as king of Scotland, ratified the transaction; the sale being a political fiction, founded on a supposed forfeiture of the Scottish branch of the family, by which the hereditary office reverted to the English branch.

The lands conferred on Walter the Steward by David I. included the barony, or what is now the county, of Renfrew, which became the chief patrimony of the family, as well as Innerwick, Hassendean, and other large estates in Teviotdale and Lauderdale. For seven generations the stewardship continued to descend without a break from father to son. Walter, the third, and grandson of the first Steward, held, in addition, the office of Justiciary of Scotland, and was one of the two ambassadors sent to conduct Marie de Couci, second wife of King Alexander II., to her adopted country. His third son, Walter, called Balloch, by his marriage with the younger daughter of Maurice, Earl of Menteith—the lady's elder sister having been banished and her rights forfeited—got the earldom of Menteith, and was ancestor of a line of earls and countesses of Menteith, of whom the Countess Margaret carried the earldom to her husband, Robert, Duke of Albany, son of King Robert II. Alexander, fourth Steward, was regent of Scotland in Alexander III.'s minority; he commanded at the battle of Largs in 1263, when the Scotch army obtained a signal victory over Haco of Norway; and invading the Isle of Man, annexed it to the Scottish crown. From his second son, Sir John Stewart, who married the heiress of Bonkyl, sprung various important branches of the family, including the Stewarts of Darnley, Lennox, and Aubigné. James, the fifth Steward, was one of the six regents of Scotland after the death of Alexander III. Walter, the sixth Steward, occupies a conspicuous place among Bruce's companions-in-arms. When but a youth, he did considerable service as one of the principal leaders at Bannockburn, and, four years later, increased the promise of his fame by his successful defence of Berwick against Edward II. in person. His marriage with Marjory, daughter of Robert Bruce, eventually brought the crown of Scotland to his family. He died at the age of 33, much lamented throughout Scotland. His son by Marjory Bruce, Robert, seventh High Steward, was regent from 1338 to 1341, and afterwards during the captivity of his uncle, David II., from 1346 to 1357; and in the midst of events which threatened a total overthrow to the liberties of Scotland, he exerted himself with zeal and energy in their defence, and was the main instrument in defeating the intrigues of David II. and Edward III. to place an English prince on the throne. On the death of David II. in 1371, he ascended the throne as Robert II., and died in 1390. He was twice married; first to Elizabeth, daughter of Sir William Mure of Rowallan, and afterwards to Euphemia, Countess of Moray, daughter of Hugh, Earl of Ross, and had issue by both unions. In consequence of Elizabeth Mure being related to him within the prohibited degrees, he obtained a dispensation for the marriage from Pope Clement VI. in 1347, in which those children who had already been born, as well as those to be born of that connection, were legitimated; and the succession to the crown was further regulated by parliament. In later times, when the true history of these proceedings was lost or mystified, the descendants of Robert II.'s first marriage came to be branded with the suspicion of illegitimacy, while those of the second marriage were in the habit of boasting of their preferable claim to the throne; and the dispensation setting the question at rest was only discovered in the Vatican in 1789 by Andrew Stuart of Castlemilk. Of the children by the first marriage, the third son, Robert, Duke of Albany, and his issue are separately noticed below. The fourth son, Sir Alexander Stewart, who got the earldom of Buchan on the forfeiture of the Comyns, ruled over the northern part of Scotland with little less than regal authority, and his savage and ferocious character obtained for him the appellation of the 'Wolf of Badenoch.' He had no lawful issue, but several natural sons, one of whom stormed the castle of Kildrummy, the residence of the Countess of Mar, forcibly wedded that lady, and possessed himself of the earldom; and others were progenitors of the branches of the family known as the Athole Stewarts, of whom the principal were the Stewarts of Garth. For the subsequent history of the royal family, see articles ROBERT II. and III.; JAMES I., II., III., IV., V.; MARY, QUEEN OF SCOTS; JAMES I. (of England); CHARLES I. and II.; JAMES II.; WILLIAM AND MARY; and ANNE.

James II. (of England) was twice married, first to Lady Anne Hyde, daughter of Lord Chancellor Hyde; and secondly, to Mary Beatrice, daughter of the Duke of Modena. By the first marriage he had Mary, queen of William III., and Anne, who succeeded to the throne, neither of whom left issue; and by the second, James, Prince of Wales, born in 1688, known as the Chevalier St George, or the elder Pretender. Prince James, who was born but a few months before his father's abdication, was commonly but groundlessly alleged to be a suppositious child, and was involved in his father's exclusion from the crown. In 1715, the party who supported him, known in history as the Jacobites, endeavoured to procure him the throne by force of arms. In Scotland, the Earl of Mar, with about 5000 men, engaged the royal forces under the Duke of Argyll at Sheriffmuir: it was a drawn battle, but the result was a delay as fatal as a defeat. In England, the rising was headed by the Earl of Derwentwater, and ended by the unconditional surrender of the insurgents at Preston, when Lords Derwentwater and Kenmure were beheaded, and other persons of note executed and attainted. James escaped to France; and for the rest of his life resided in obscurity principally at Rome, where he died in 1766. In 1719, he married one of the wealthiest heiresses in Europe, Maria Clementina Sobieski, grand-daughter of John Sobieski, king of Poland, and by her had two sons, Charles Edward Lewis Casimir, born 1720, known as the young Pretender (see STUART, CHARLES EDWARD), and Henry Benedict Maria Clement, Cardinal York, born 1725. Henry Benedict, second son of the Chevalier St George, went to France in 1745 to head an army assembled at Dunkirk for the invasion of England, but the news of the defeat of Culloden put an end to his plan. He then returned to Rome, took orders, and was advanced to the purple by Benedict XIV in 1747. During his brother's life, he was known as Cardinal York; but after his death he assumed

the regal style as Henry IX., king of England. His various bishoprics and rich church livings enabled him for long to live in great splendour; but the expulsion of Pius VI. from Rome, and other events of the Revolution, drove him to Venice, aged and infirm, stripped of his means, and reduced to absolute poverty. His deplorable situation becoming known to the British court, George III. settled on him an annuity of £4000, which the cardinal accepted with gratitude, and enjoyed during the remainder of his life. He died in 1807, at the age of 82, the last surviving descendant of James II.

Next to the exiled Stewarts in representation of the royal house as heir-of-line came the descendants of Henrietta Maria, daughter of Charles I., who was married to Philippe, Duke of Orleans, brother of Louis XIV. of France. This princess had two daughters, of whom the elder, Mary, was queen to Charles II. of Spain, but died childless; the younger, Anna Maria, married Victor-Amadeus, Duke of Savoy and king of Sardinia, and was mother to Charles-Emmanuel III., king of Sardinia, and grandmother to Victor-Amadeus III., king of Sardinia. Victor-Amadeus had three sons who successively occupied the Sardinian throne as Charles-Emmanuel IV., Victor-Emmanuel I., and Charles-Felix, and a daughter who married Charles X. of France, and was mother of Henri, Duc de Bordeaux, present representative of the French Bourbons. Victor-Emmanuel and Charles-Felix left daughters only; and the present senior co-representative as heir-of-line of the House of Stewart, as well as that of Tudor, is Francis V., ex-Duke of Modena, grandson of Victor-Emmanuel IV. by his eldest daughter, Mary Beatrice. Victor-Emmanuel, now king of Italy, comes from the collateral branch of Savoy-Carignan, which does not participate in the Stewart descent.

The branch of the family which the parliamentary settlement called to the throne on the death of Anne were the descendants of the Electress Sophia of Hanover, grand-daughter of James VI. by her mother the Princess Elizabeth Stewart, Electress Palatine and queen of Bohemia. By this destination, not only were the already-mentioned descendants of Charles I.'s daughter, the Duchess of Orleans, excluded, but also the sons of the king of Bohemia and their descendants. The eldest son, Charles Lewis, Duke of Bavaria, is represented through his daughter, the Duchess of Orleans, by the Comte de Paris, grandson of Louis Philippe, late king of the French. Her Majesty Queen Victoria is sixth in descent from and representative of the Electress Sophia, the line of descent being through George I.; George II.; Frederick, Prince of Wales; George III.; and Edward, Duke of Kent.

We have now briefly to notice the most important cadets of the House of Stewart.

Dukes of Albany, Earls of March, Lords of Annandale and Man.—The dukedom of Albany, forfeited on the attainder of Duke Murdoch, nephew of Robert III. (see *infra*), was conferred on Alexander, second son of King James II. of Scotland, who also obtained the earldom of March, and lordship of Annandale and Man. Albany, falling under suspicion of James III., was arrested, and escaping from custody in Edinburgh Castle to France, was attainted. He afterwards took part in a plot with the discontented barons and Edward IV. of England to place himself on the throne, and joining the English army, captured Berwick. After making his peace with James, and being restored to his dukedom, he again rebelled, and invading Scotland with the Earl of Douglas, was routed at Lochmaben, and once more attainted. He was first married to Lady Catherine Sinclair, daughter of the Earl of Orkney and Caithness, from whom he obtained a divorce on the ground of propinquity of blood, by which his son Alexander was bastardised. By his second wife, the daughter of Bertrand, Count de la Tour d'Auvergne, he had a son John, who was restored to the dukedom, assumed the regency of Scotland in James V.'s minority, and was declared heir to the throne. By the settlement of the crown under Robert II., John, Duke of Albany, would, had he survived James V., have had a preferable claim to Mary. After a regency of eight years, during which he gave offence by his hauteur and French predilections, he returned to France, became governor of Bourbonnais, attended Francis I. in his unfortunate expedition into Italy in 1525, and died in 1536. By his wife, Anne de la Tour d'Auvergne, he left no issue.

Dukes of Albany, Earls of Fife and Menteith.—Robert, second surviving son of Robert II. and Elizabeth Mure, obtained the earldom of Menteith by marriage with its heiress, and the earldom of Fife by indenture with his sister-in-law, the countess, and was appointed Great Chamberlain of Scotland in 1383. He practically exercised the regency during his father's declining years, and continued to wield the supreme authority after the succession of his timid and irresolute brother, Robert III., who bestowed on him the title of Duke of Albany—i. e., of all Scotland north of Forth and Clyde. His unscrupulous ambition led him to get rid of his nephew, the Duke of Rothesay, by starving him, in order to pave his way to the throne; and Prince James was sent abroad by his father, lest he should meet a similar fate. On Robert III.'s death, Albany at once became Regent of Scotland, and wielded the chief power of the state during the minority and captivity of James I. By his first marriage to Margaret, Countess of Menteith, he had a son, Murdoch, who, on his father's decease in 1419, succeeded, unchallenged, to the regency. By his second wife, Muriella, daughter of Sir William Keith, the Mariscbal, he had, besides two younger sons of whom there was no succession, a son, John, created Earl of Buchan, on whom Charles VII. bestowed the office of Constable of France after the battle of Baugé, and who fell at Verneuil, leaving only a daughter, who married the second Lord Seton, and is represented by the Earl of Eglinton. Duke Murdoch married the eldest co-heiress of the Earl of Lennox, and had four sons. On James I.'s restoration, his vengeance fell on Duke Murdoch, his sons Walter and Alexander, and his father-in-law, Lennox, who were all put to death, and the dukedom of Albany forfeited to the crown. Murdoch's youngest son, James, generally known as 'James the Gross,' escaped to Ireland, where he had a numerous issue by a lady of the family of the Lords of the Isles, some of whom were brought to Scotland, and raised to high honours by James II., and received letters of legitimation, which in the 15th c. conferred far more nearly than at a later date the full rights of legitimacy. The eldest, who was created Lord Avandale, enjoyed for life the estates of the earldom of Lennox, which had belonged to his grandmother, to the exclusion of the descendants of that lady's sisters; and we afterwards find the Earl of Arran, a descendant of the sixth son of James the Gross, entering a protest in the parliament of 1585 regarding the perfect legitimacy of the house of Ochiltree. From the youngest son, James (not legitimated), sprung the Stuarts of Ardvorlich, Glenbuckie, and others in Balquidder.

Lords Avandale, Ochiltree, and Castlestuart; Earls of Castlestuart.—Andrew Stewart, eldest legitimated son of James the Gross,

and grandson of Murdoch, Duke of Albany, was created Lord Avandale in 1455, and held the office of Chancellor to James III. On his death without issue in 1488, he was succeeded by his nephew, Andrew, eldest son of his also legitimated brother, Andrew, who had three sons. The eldest of these, Andrew, third Lord Avandale, exchanged his title for that of Ochiltree, and was father of Andrew, second Lord Ochiltree, sometimes called the 'Good Lord Ochiltree,' an active promoter of the reformed faith, one of the Lords of the Congregation, an accomplice in the assassination of Riccio. One of his daughters became the second wife of John Knox; and his younger son, James, has an unenviable notoriety in history. He was the unprincipled and arrogant favourite of James VI.'s early years; held along with other offices that of Chancellor of Scotland; was created Earl of Arran on the forfeiture of the Hamilton family; and enriched himself with the spoils of the estates of Angus, Mar, Glammis, and other forfeited lords. But his downfall was as sudden as his elevation. At the Raid of Stirling, in 1585, he was stripped of his honours, offices, and spoils, the earldom of Arran being restored to the Hamiltons; and in 1596, he was assassinated by Sir James Douglas. The second Lord Ochiltree was succeeded by his grandson, Andrew, third Lord Ochiltree, who resigned the lordship of Ochiltree to his cousin, Sir James Stewart of Killeith, son of the Earl of Arran, settled in Ireland, where extensive lands were bestowed on him by James VI., and was in 1619 created Lord Stuart of Castlestuart in the peerage of Ireland. After the death of the fifth Lord Castlestuart in 1684, the title remained dormant till claimed by Andrew, ninth lord, as heir-male of the body of the first lord, which claim was proved to the satisfaction of the Irish House of Lords in 1774. The younger branch of the house, to whom the title of Ochiltree was transferred, had come to an end in 1673, and Lord Castlestuart claimed also the Ochiltree title; but the evidence adduced by him was held insufficient by the British House of Lords. He was, in 1793, created Viscount Castlestuart, and in 1800, Earl of Castlestuart; and the present and fourth earl is his grandson.

LORDS METHVEN.—Henry Stewart, second son of Andrew, second Lord Avandale, became, in 1526, third husband of the Princess Margaret of England, widow of James IV., and divorced wife of Archibald, Earl of Angus. In 1528, he was created Lord Methven. He left no children by the queen-dowager, but by a second marriage had a son, who became second Lord Methven, and in the person of whose son, the third lord, the succession terminated.

LORDS DOUNE, EARLS OF MORAY, LORDS ST COLME.—Sir James Stewart of Beath, third son of Andrew, second Lord Avandale, obtained from James V. the hereditary command of the castle of Doune, with the stewartry of Menteith. He had two sons, from the younger of whom sprang the Stewarts of Burray, in Orkney. The elder son, James, on the dissolution of the monasteries, obtained the lands of St Colme, and was created Lord Doune in 1581. His son, the second Lord Doune, married Elizabeth, the only child of James Stuart, Earl of Moray, Regent of Scotland, natural son of James V. by Margaret, daughter of John, Lord Erskine (see MURRAY, JAMES, EARL OF), and thereupon became Earl of Moray. This nobleman is known in history as the 'Bonny Earl of Moray,' and fell a victim to his hereditary enemy, the Earl of Huntly, in 1592. His son, the third earl, is believed to have got a new investiture to heirs-male, and from him descends the present and twelfth Earl of Moray. The ninth earl became, in 1796, a peer of Great Britain, as Baron Stuart of Castlestuart. Henry Stuart, younger brother of the 'Bonny Earl of Moray,' was made a lord of parliament as Lord St Colme in 1611, a title which, however, became extinct on his son's death without issue, and the estates reverted to the Earl of Moray. The family of Stuart of Dunearn sprang from a younger brother of the fifth earl.

EARLS AND MARQUISES OF BUTE, LORDS WHARNCLIFFE, LORDS STUART DE ROTHESAY.—Sir John Stuart, a natural son of Robert II., was made hereditary sheriff of Bute and Arran; and his descendant and representative, Sir James Stuart, had a baronetcy conferred on him in 1627. Sir James Stuart, grandson of the above Sir James, a privy councillor to Queen Anne, and a strenuous opponent of the Union, was raised to the peerage as Earl of Bute. The fourth earl was advanced to the Marquisate of Bute. The present peer is the third Marquis of Bute. A younger son of the third Earl of Bute was raised to the peerage as Lord Wharncliffe, and a grandson of the same earl as Lord Stuart de Rothesay. The latter title is now extinct.

EARLS OF ANGUS.—Sir John Stewart (commonly called of Bonkyl), brother of James, fifth Steward of Scotland, was progenitor of some of the most considerable branches of the family, and direct ancestor in the male line of James VI. and the Stuart kings who followed him. He married Margaret, daughter and heiress of Sir John Bonkyl of Bonkyl, in virtue of which alliance most of his descendants added the bend or buckle of the Bonkyl coat to the fess of the Stuart escutcheon. The issue of this marriage was five sons—1. Sir Alexander Stewart of Bonkyl; 2. Sir Alan Stewart of Dreghorn; 3. Sir Walter Stewart of Dalswinton; 4. Sir John Stewart of Jedworth; 5. Sir James Stewart of Pierston; and a daughter, Isabel, who married the celebrated Thomas Randolph, Earl of Moray, nephew of Robert Bruce. The eldest son, Sir Alexander, succeeded to Bonkyl on his maternal grandfather's death, and was father of Sir John Stewart, created Earl of Angus in 1329. The third earl, grandson of this Sir John, was the last male descendant of Sir Alexander of Bonkyl; and on his death, the earldom devolved on his aunt, Margaret Stewart, Countess of Angus in her own right. This lady was married to Thomas, Earl of Mar, by whom she had no issue; but she had a natural son, George, by William, first Earl of Douglas (a connection then deemed incestuous, the earl being brother-in-law to her husband), upon whom, on her resignation, the earldom of Angus was conferred by Robert II. in 1389, and who was ancestor of the Douglases, Earls of Angus.

EARLS OF DARNLEY, EARLS AND DUKES OF LENNOX, LORDS OF AUBIGNÉ.—Sir Alan Stewart of Dreghorn, second son of Sir John of Bonkyl, who with his brothers, John and James, fell at Halidon Hill in 1333, was ancestor of this distinguished line. His domains included the extensive lands of Cruickston and Darnley, in Renfrewshire, to which his grandson, Sir Alexander Stewart, added Galston by his marriage with Janeta, daughter and heiress of Sir William Keith of Galston, and widow of Sir David Hamilton of Cadyow. Sir John Stewart of Darnley, eldest son of this marriage, distinguished himself much in the French wars, when succours were sent from Scotland to the aid of the Dauphin, afterwards Charles VII. He was Constable of the Scots army in France, and contributed greatly to the victory of Baugé, in recompense for which the lands and lordship of Aubigné and Concressault, in France,

were conferred on him, as well as the county of Evreux, with permission for himself and his descendants to quarter the royal arms of France. In 1428, he was one of the ambassadors sent by Charles to negotiate a marriage between the Dauphin and the Princess Margaret of Scotland; and in the following year, along with a younger brother, William, fell at the siege of Orleans. His marriage with Elizabeth, one of the daughters and co-heirs of Duncan, Earl of Lennox, afterwards added the Lennox estates to the family possessions. According to arrangements made by permission of the king of France, the lordship of Aubigné was generally enjoyed by a younger member of the family; it went in succession to the third son of Sir John Stuart, and to his son, Bernard Stuart. The latter, alike distinguished for military and statesmanlike qualities, had a share in the victory of Bosworth, and supported by arms Charles VIII.'s claim to the throne of Naples. He held, among other dignities, those of Viceroy of Naples, Constable of Sicily and Jerusalem, and Duke of Terra Nova. His grandson, Sir John Stuart, was advanced to the dignity of a lord of parliament under the title of Lord Darnley; he was also served heir to half the Lennox domains, and claimed the earldom of Lennox. His elder son, Matthew, second earl of Lennox, fell at Flodden; his younger son, Robert, got the lordship of Aubigné in 1508, on the death, without issue, of Bernard Stuart, whose daughter was his first wife. John, the third Earl of Lennox, was son of the second earl by Elizabeth, daughter of James, Lord Hamilton, and niece of James III.; he was one of the lords of the regency in James V.'s minority, and in endeavouring to rescue the youthful king from the thraldom of the Douglases, he was taken prisoner at Linlithgow, and murdered by Sir James Hamilton of Finnart, Arran's natural son. This earl was married to Lady Anne Stewart, daughter of John, Earl of Athole, and had three sons, Matthew—who succeeded him as fourth earl—Robert, and John. The termination of the male line of Robert III. by the death of James V., along with the imperfect legitimacy of the descendants of the house of Albany, placed Matthew, Earl of Lennox, in the position of heir-male of the Stewards of Scotland. He married Lady Margaret Douglas, only child of Archibald, Earl of Angus, by the queen-dowager Margaret, sister of Henry VIII., an alliance which brought his children into the position of being nearest heirs after Mary, Queen of Scots, to the crown of England. The issue were two sons, the elder of them the unhappy husband of the unhappy Queen Mary, and father of James VI. Lennox, after spending his youth in France and in the wars in Italy, returned home in 1543, and took an active part in the negotiations for the proposed marriage of Queen Mary with Edward VI. His subsequent intrigues with England led to his banishment and attainder, but he was recalled and restored to his honours by Mary. After that queen's forced resignation, he was appointed to the regency, and when on his way to hold a parliament at Stirling in 1571, he was attacked by a party of the queen's friends and mortally wounded.

The earldom and estates of Lennox, which, on the death of the fourth earl, had devolved on James VI. by right of blood, were conveyed by him to his uncle, Charles, fifth Earl of Lennox, brother of Lord Darnley. The marriage of this earl in 1574, with a sister of the first Earl of Devonshire, gave great displeasure to Elizabeth, whose own doubtful legitimacy made her very sensitive to possible pretensions to the throne. The sole issue of that union was a daughter, Arabella, and the earldom went in succession to the fifth earl's uncle, Robert, Bishop of Caithness, and his cousin, Esme, son of John Stewart, Lord of Aubigné, youngest son of the third Earl of Lennox, who was created Duke of Lennox. The near relationship to the crown, both of England and Scotland, in which the fifth earl's daughter, the unfortunate Lady Arabella Stewart, stood, made her an object of jealousy equally to James and Elizabeth. Elizabeth first interfered to prevent her contemplated marriage with her cousin, Esme, Duke of Lennox, and afterwards imprisoned her for listening to overtures from a son of the Earl of Northumberland. The result was, that this lady formed an illicit connection with William Seymour, afterwards Marquis of Hertford; on the discovery of which, both were summoned by James before the Privy Council, and severely reprimanded. The consequence was the reverse of what was intended. Lady Arabella privately married Seymour; which becoming known, she and her husband were committed into custody. Both effected their escape: Lady Arabella was overtaken in Calais Roads, and imprisoned in the Tower, where these undeserved oppressions drove her to a condition of lunacy, in which she died, 27th September 1615. Esme, first Duke of Lennox, had two sons, Ludovic and Esme, successively second and third Dukes of Lennox. The former held the offices of Great Chamberlain and High Admiral of Scotland, and was created Earl of Richmond, Earl of Newcastle, and Duke of Richmond in the peerage of England. The latter, who was also Lord of Aubigné, was created Earl of March in England, and was father of James, fourth Duke of Lennox, who fell under the guardianship of James VI. as his nearest heir-male, and had the title of Duke of Richmond, which had expired at his uncle's death, revived in his favour in 1641. On the death of the sixth and last duke without issue in 1672, King Charles II., as nearest heir-male, was served heir to him in special.

Lord Pittenweem.—Alexander Stewart of Galston, younger brother of the first Lord Darnley, got from his brother the lands of Dreghorn and Galston. His great-grandson, Thomas Stewart of Galston, had two sons, Thomas and William. The younger son, William, became commendator of the Priory of Pittenweem, and his son was made a Lord of Parliament as Lord Pittenweem. The line of the elder son, Thomas, failed in 1650 in the person of Ludovic Stuart of Galston.

Stuarts of Castlemilk.—The earliest proved ancestor of this important and well-allied branch of the Stewarts, was Sir William Stewart of Castlemilk, who in 1398 was appointed umpire for the preservation of the Western Marches, probably descended from the Stewarts of Darnley. Archibald Stuart of Castlemilk was created a baronet of Nova Scotia by Charles II. His line failed on the death of Sir John Stuart, fifth baronet, in 1797, when the succession devolved on Andrew Stuart of Torrance and Castlemilk, M.P., the author of *The Genealogical History of the Stewarts*, descended of an uncle of the first baronet, who died without issue.

Steuarts of Allanton, Coltness, &c.—This family, which first came into notice in the 16th c., and includes various men of eminence who would do honour to any line of ancestry, is of unascertained descent, but some traditional accounts make it a branch of Castlemilk. Sir James Steuart of Coltness and Kirkfield, younger brother of Sir Walter of Allanton, and his son, Sir Thomas, were active Covenanters; and the latter, an energetic member of King William's first parliament, and the framer of the Act of 1690 for the regulation of the Church of Scotland, was in 1693 made a baronet. His son, Sir David Steuart of Coltness, accompanied Archibald, Earl of Argyll, in his descent on Scotland, for

which he was sentenced to death, but escaped, and was afterwards pardoned. His brother, Sir Robert Steuart, fourth baronet, was among the more distinguished scientific men of the beginning of the 18th c., and filled the Natural Philosophy chair in the university of Edinburgh, in which he was succeeded by his son. Sir James Steuart of Goodtrees, Lord Advocate under King William and Queen Anne, author of the Answers to *Dirleton's Doubts*, and one of the most eminent jurists of his time, was younger brother to the first baronet of Coltness. His son, Sir James Steuart of Goodtrees and Coltness, also a distinguished lawyer, and created a baronet in 1705, was father of another Sir James, who was Prince Charles's confidential agent at the court of France, and at the same time the author of various works of merit on political economy and kindred subjects.

EARLS OF GALLOWAY.—Sir Walter Stewart of Dalswinton, third son of Sir John of Bonkyl, obtained the lands of Dalswinton from King Robert Bruce, and Garlies from his nephew, John Randolph, Earl of Moray. His grandson, Sir Walter of Dalswinton, left an only daughter, Marion, who married Sir John Stewart, son of Sir William Stewart of Jedworth, and probably a descendant of John, fourth son of Sir John of Bonkyl. Sir Alexander Stewart of Garlies, eighth in descent from Sir John and Marion Stewart, was created Lord Garlies in 1607, and Earl of Galloway in 1623. In 1796, John, seventh Earl of Galloway, was created a British peer as Baron Stewart of Garlies. Randolph Stewart, ninth Earl of Galloway, is present representative.

LORD BLANTYRE.—This branch of the House of S. is descended from Sir Thomas Stewart of Minto, third son of Sir William of Dalswinton and Garlies, the eldest son of the heiress, Marion Stewart. Sir John Stewart of Minto, great-grandson of that Sir Thomas, had two sons. The line of the elder, Sir Matthew, became extinct in the person of Sir John Stuart, who died in the Darien expedition of 1697. The second son, Walter, was educated along with James VI. under George Buchanan, and had the priory of Blantyre bestowed on him by that monarch: he was Privy Councillor, Keeper of the Privy Seal, one of the four Commissioners of the Treasury and Exchequer, called Octavians, and afterwards High Treasurer. In 1606 he was raised to the peerage as Lord Blantyre. The present representative of this branch is Charles Stuart, twelfth Lord Blantyre.

VISCOUNTS MOUNTJOY, EARL OF BLESSINGTON.—Sir William Stewart, descended from Walter Stewart of Tonderghie, fourth son of Sir William of Dalswinton and Garlies, who was in great favour with James VI., and undertaker for the plantation of escheated lands in Ulster, was made a baronet of Ireland in 1623. His grandson, Sir William Stewart, second baronet, was in 1682 created Baron Stewart of Ramalton, and Viscount Mountjoy in the peerage of Ireland. He served in Hungary at the siege of Buda, and in 1688 undertook a mission from Lord-deputy Tyrconnel to James II., then at Paris, when he was thrown into the Bastille, and was a prisoner there for four years. He afterwards joined King William at Flanders, and was killed at the battle of Steinkirk. The second viscount, his son, married the daughter and eventually heiress of Viscount Blessington. Their son, the third Viscount Mountjoy, was advanced to the Earldom of Blessington, which title, as well as that of Mountjoy, became extinct on his decease in 1769, though the baronetcy exists.

EARLS OF ATHOLE, LORDS OF LORN AND INNERMEATH.—Sir James Stewart, fifth son of Sir John of Bonkyl, killed with his brothers Alexander and John at Halidon Hill, had a grant from Robert Bruce of the lands of Pierston and others in Ayrshire, and was father of Sir Robert Stewart of Shanbothy and Innermeath. This Sir Robert had two sons, John and Robert, who married the two co-heiresses of the princely house of De Ergadia, Lord of Lorn, who were also co-heirs of the line of Robert Bruce. The younger son, Robert of Durrisdeer, was ancestor of a line of Stewarts of Rossyth and Craigiehall, to whom Oliver Cromwell's mother is said, on no very certain grounds, to have belonged, and which probably came to an end about 1830. The elder son, Sir John, whose wife was the elder and principal co-heiress, had five sons. The eldest, Robert, became Lord of Lorn; the third, Sir James, known as the Black Knight of Lorn, was husband of James I.'s widow; and his eldest son, brother uterine of James II., was created Earl of Athole, with remainder to the heirs-male of his body. His great-grandson, John Stewart, fourth Earl of Athole, was much involved in the political events of Mary's and James VI.'s time. An adherent of the old faith, and at first a staunch supporter of the queen, he nevertheless assisted in her seizure, and took a lead in the association formed in 1567 for the defence of James VI. He headed the confederacy which took up arms against the Regent Morton, and induced James to call a parliament. In 1577, he became Chancellor of Scotland, and died suddenly under suspicion of poison from Morton. His son, the fifth Earl of Athole, had no male issue, but daughters, of whom the eldest was married to the Earl of Tullibardine; and at his death, the earldom fell to the crown, and was conferred on the elder branch of the House of Innermeath, to which we now revert.

Robert, Lord of Lorn, eldest brother of the Black Knight, had two sons. The elder of these, John, second Lord of Lorn, had three daughters, co-heiresses, who respectively married the Earl of Argyll, Campbell of Glenorchy, and Campbell of Ottar, the lordship of Lorn passing to the Argyll family; he had also a natural son, ancestor of the Stewarts of Appin. The second son of Robert, Lord of Lorn, was Walter, Lord Innermeath, whose descendant and representative, John, sixth Lord Innermeath, obtained the earldom of Athole on the death of the above-mentioned fifth earl; with a remainder to the heirs-male of his body, which came to an end on the death, in 1625, of his only son, who had succeeded him in the earldom. The earldom of Athole was then conferred by Charles I. on the Earl of Tullibardine, grandson through his mother of the fifth Earl of Athole, from whom the existing ducal House of Athole is descended. From Alexander, fourth son of Sir John Stuart of Innermeath, descend the family of Stewart of Grandtully, on whom a baronetcy was conferred in 1683.

EARLS OF BUCHAN.—The earldom of Buchan was, in 1469, bestowed on James Stewart, second son of the Black Knight of Lorn, and brother uterine of James II. By his marriage with the heiress of Auchterhouse, his family became heritable sheriffs of the county of Forfar. His legitimate line ended in the fourth generation in an heiress, Christian, Countess of Buchan, who, marrying a son of Sir Robert Douglas of Lochleven, carried the earldom of Buchan into his family.

EARLS OF TRAQUAIR.—This James Stewart, first Earl of Buchan, had, besides his lawful issue, a natural son, James, legitimated in 1489, on whom his father conferred the lands of Traquair. His descendant, Sir John Stuart, was created by Charles I. Lord Stuart of Traquair in 1628, and in 1633, Earl of Traquair. The title became extinct or dormant on the death of the eighth earl in 1861.

Various works have been written to elucidate the

history of the S. family, or particular branches of it, including Symson's *General and Historical Account of the Stewarts* (Edin. 1712); Hay of Drumboote's *Essay on the Origin of the Royal Family of the Stewarts* (1722); Duncan Stewart's *Historical and Genealogical Account of the Royal Family of Scotland, and of the Surname of Stewart* (Edin. 1739); Noble's *Historical Genealogy of the Royal House of Stewart* (Lond. 1795); and Andrew Stuart of Castlemilk's *Genealogical History of the Stewarts* (Lond. 1798), a work full of laborious research, but nearly confined to the Houses of Darnley, Lennox, and Castlemilk. See also *The Genealogy of the Stewarts refuted* (Edin. 1799), and the rejoinder to it in Andrew Stuart's *Supplement to the Genealogical History of the Stewarts* (1799); Chalmers's *Caledonia* (1807—1824); Crawfurd's *Description of the Shire of Renfrew, with Supplement* by George Robertson (Paisley, 1818); Riddell's *Saltfoot Controversy*, privately printed at Edinburgh, 1819.

STEWART, Dugald. This philosopher was born in Edinburgh, on the 22d November 1753. His father was Matthew Stewart, Professor of Mathematics in the university of Edinburgh. He entered the High School in his eighth year, and remained till his thirteenth. During the last two years of his attendance, when in the rector's classes, he was principally under Alexander Adam, afterwards well known for his classical scholarship, who then began to teach as the rector's substitute. His subsequent course at the university extended from 1765 to 1769. In the departments of study where his own career afterwards lay, he was fortunate to find professors of ability and distinction; the Logic chair was filled by John Stevenson, who lectured on logic, metaphysics, rhetoric, and the history of philosophy; the Moral Philosophy chair was occupied by Adam Ferguson. While S. gave his highest promise in these subjects, he also made great attainments in mathematics and natural philosophy, and likewise in classics. In 1771, he went to study at Glasgow, partly with a view to one of the Snell scholarships at Baliol College, Oxford, and partly to attend the lectures of Dr Reid. It was while there that he wrote an essay on Dreaming, which was his first effort in mental philosophy, and contained the germs of many of his subsequent speculations. He lived in the same house with Archibald Alison, the author of the *Essay on Taste*, and the two became intimate friends through life. He was at Glasgow only one session. In 1772, in his 19th year, he was called upon by his father, whose health was failing, to teach the mathematical classes in the university of Edinburgh; in 1775, he was elected joint professor, and acted in that capacity till 1785. In 1778, Adam Ferguson was absent from his post on a political mission to America, and S. taught the moral philosophy class in addition to his mathematical classes. The lectures that he gave on this occasion were wholly his own, and were delivered from notes, as was his practice in after years. On the resignation of Ferguson in 1785, he was appointed Professor of Moral Philosophy, and continued in the active duties of the class for 25 years. His lectures were greatly admired and numerously attended. He went over a wide compass of subjects: Psychology, or the Science of Mind proper, Metaphysics, Logic, Ethics, Natural Theology, the Principles of Taste, Politics, and last of all, Political Economy, which, from the year 1800, he treated in a separate course. In 1792, appeared his first volume of the *Elements of the Philosophy of the Human Mind*. In 1793, he published his *Outlines*. He read before the Royal Society of Edinburgh, in 1793, his *Account of the Life and Writings of Adam Smith*; in 1796, the *Account of the Life and Writings of Principal Robertson*; and in 1802, the *Account of the Life and Writings of Dr Reid*. In 1805, he took a prominent part in the Leslie controversy; being the author of a pamphlet setting forth the facts of the case, and also, in the General Assembly, giving vent to his indignation at the proceedings against Leslie. In 1806, on the accession of the Whig party to power, he received a sinecure office worth £300 a year. The death of his second son, in 1809, gave a blow to his health, otherwise indifferent, and he was unable to lecture during part of the following session; Dr Thomas Brown, at his request, acting as his substitute. The following year, Brown was appointed conjoint professor, and taught the class till his death in 1820. From 1809, S. lived in comparative retirement at Kinneil House, Linlithgowshire, which the Duke of Hamilton placed at his service. In 1810, he published his *Philosophical Essays*; in 1814, the second volume of the *Elements*; in 1815, the first part, and in 1821, the second part, of the *Dissertation on the History of Ethical Philosophy*; in 1827, the third volume of the *Elements*; and in 1828, a few weeks before his death, the *Philosophy of the Active and Moral Powers*.

On the death of Brown, S. exerted himself to secure the appointment of Sir W. Hamilton to the chair, but the influence used with the Town Council in behalf of John Wilson was overpowering; the votes stood 21 for Wilson, 9 for Hamilton. S. resigned his conjunct professorship on the 20th June 1820.

The philosophy of S. was the following up of the reaction commenced by Reid against the sceptical results that Berkeley and Hume drew from the principles of Locke. Both Reid and S. professed the Baconian method of observation and induction, as against mere ontology, but considered that these processes of investigation could establish certain ultimate truths of a higher certainty than themselves. Hence arose the principles of common sense of Reid, in which S. for the most part acquiesced. S. also followed and improved upon Reid in that systematic exposition of all the powers of the mind, which rendered mental philosophy for the first time a subject of study, independent of metaphysical, logical, and ethical applications; although he also followed it out in all these directions with his usual perspicacity and felicity of exposition. His contributions to the philosophy of Taste, in the *Philosophical Essays*, are among the best parts of his writings.

On the whole, although S. was not one of the most original thinkers in his department, yet, by the force of his teaching and the compass of his writings, he did more than almost any man to diffuse an interest in the speculations connected with the human mind. His collected works have been edited by Sir W. Hamilton, in 11 vols., to which Professor Veitch has contributed his biography.

STEW'ARTON, a town of Scotland, county of Ayr, on the right bank of the Annock, five miles north-west of Kilmarnock, and nominally a station on the Glasgow and South-Western Railway, although the place called *S. Station* is several miles distant from the town. S. owes its prosperity to its woollen and Scotch bonnet manufactures; but it also carries on a variety of minor industries, such as carpet-weaving, Ayrshire needle-work, and the making of spindles for mills. Pop. 3145.

STEW'ARTRY, the name which was given in Scotland to a district governed by a steward, an officer appointed by the king with jurisdiction over crown-lands, and powers similar to those of a lord of regality. While the civil jurisdiction of a steward was equivalent to that of a sheriff, his criminal

jurisdiction was much more extensive. The only remaining trace of this jurisdiction exists in the term stewartry, which in place of county is applied to the district of Kirkcudbright. Galloway was in early times rather a tributary dependency of Scotland than an integral portion of the kingdom, and retained its old Celtic proprietary, and peculiar laws and usages, which were adverse to the introduction of a sheriffdom. It was for a long time ruled by a line of lords, who were among the most powerful feudatories of the Scottish crown. The Comyns, who in the course of time succeeded to the lordship, were overthrown and expatriated by Bruce; and it seems to have been on their forfeiture that Eastern and Central Galloway were erected into the present stewartry, Western Galloway being already under the jurisdiction of the sheriff of Wigton. On the abolition of heritable jurisdictions in 1747, various regalities and baronies which had existed within the district were done away with, and the emancipated stewartry was placed under a steward-depute, whose functions were in every practical point of view the same as those of a sheriff-depute. Act 1 Vict. c. 39, declares that in any existing or future statute the words sheriff, sheriff-clerk, &c. shall be held to apply to steward, steward-clerk, &c.

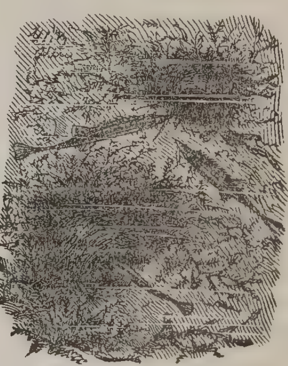
STEWING, in Cookery, a very economical way of preparing meat and fruits for food. It differs from boiling in this respect, that only a small quantity of water is used, and the heat applied is so gentle as only to *simmer* it. A stew-pan should be well fitted with a lid, and the more slowly the ebullition is carried on the better. As the small quantity of water is retained as gravy, nothing is lost. Meat prepared in this way is tender and savoury, but, owing partly to the richness of the gravy, is not very digestible.

STEY′ER, a town of Upper Austria, at the confluence of the Steyer and the Enns, 23 miles south-east of Linz. It is a great seat of the iron and steel manufactures of Austria, and also carries on important manufactures of paper, woollens, and hosiery. Pop. 10,600.

STHAVIRA (a Sanscrit word, meaning *old*) is, in Buddhist hierarchy, the name of the 'elders' or 'venerables,' who, after the death of *the* Buddha S′âkyamuni, taught the doctrine, presided at the Buddhist assemblies, &c., and, since the time of As′oka, were invested with a kind of episcopal power. In the sectarian history of Buddhism, Sthavira is the name of those Arhats who did not follow the schism of the Mahâsânghikas (q. v.), but adhered to the old doctrine. According to another account, the Sthaviras are one of the four divisions of the Vaibhâshika system of Buddhism, and claim for their founder Kâtyâyana, the disciple of S′âkyamuni.—See C. F. Koeppen, *Die Religion des Buddha* (Berlin, 1857); and W. Wassiljew, *Der Buddhismus, seine Dogmen, Geschichte und Literatur* (St Petersburg, 1860)

STICKING-PLASTER, or COURT-PLASTER, is best prepared in the following manner: Two solutions are first made, one of an ounce of isinglass in eight ounces of hot water, and the other of two drachms of gum-benzoin in two ounces of rectified spirit. These solutions are to be strained and mixed. Several coats of this mixture, kept fluid by a gentle heat, are then to be applied with a camel's-hair brush to a piece of black silk stretched on a frame, each coat being allowed to dry before the next is applied. A layer of a solution composed of one ounce of Chian turpentine in two ounces of tincture of benzoin, is then to be applied to the other side of the silk, and allowed to dry. In place of the ordinary black sticking-plaster, some persons prefer colourless plaster, or *Gold-beater's Skin* (q. v.).

STI′CKLEBACK (*Gasterosteus*), a genus of acanthopterous fishes, with ventral fins, abdominal, belonging to the order *Hemibranchii* (Cope), with the *Centriscidæ*, *Fistulariidæ*, etc., and to a distinct family (*Gasterosteidæ*), in which the first dorsal fin is represented by a number of detached spines, a single strong spine occupies the place of the ventral fins, there are only three branchiostegal rays, the gill-covers are not armed, and the body is mailed by plates on the lateral line, and destitute of scales. The species are found in fresh and brackish waters, and in the sea, in cold and temperate regions; and are small fishes, very interesting from their habits and the beauty of their colours, which they change in a remarkable manner, partly according to the colours of surrounding objects, and partly through the influence of their own passions. The THREE-SPINED S. (*G. aculeatus* or *trachurus*), having three spines instead of the first dorsal, is extremely abundant in rivers, ponds, and brackish waters in most parts of Britain and of Europe, and is sometimes also found in the sea. Sticklebacks caught in a river readily accommodate themselves to living in a salt-water aquarium. It seldom exceeds two inches and a half, or three inches in length. Cuvier and Valenciennes, Yarrell, and others distinguish from this several other species, some of which are also



Sticklebacks and Nests.

British, differing in size, the armature of the sides, and other particulars (4 to 15 spines); but some naturalists are still inclined to regard them as mere varieties. The common fresh-water species are sometimes so abundant in ponds, ditches, and the still parts of rivers, as in Lincolnshire and other flat parts of the east of England, that they are used for manure. They are seldom used as food, yet they are said to be excellent for this purpose. Oil has sometimes been expressed from them. In the aquarium, or in their native waters, their combats are very amusing. They are excessively pugnacious, particularly at the breeding season. The larger often devour the smaller, and they destroy the fry of fishes to a prodigious extent; they feed also on aquatic larvæ, and are probably of great use in preventing the excessive multiplication of many kinds of insects. Their nest-building is particularly interesting, and in them nest-building was first observed among fishes. They collect small pieces of straw or stick, with which the bottom of the nest is laid among water-plants, and these they cement together by an exudation from their own bodies, which forms a thread through and round them in every conceivable direction. The thread is whitish,

fine, and silken. The sides of the nest are made after the bottom. The nest of the Fresh-water S. is about the size of a small hazel nut. The eggs, about the size of poppy-seeds, are deposited within. The male makes the nest, into which he introduces the female for the laying of the eggs, and he afterwards watches it with great care—a care not unnecessary, as the eggs are most acceptable food to any other S. which can get at them.

STIFF-NECK (known also as WRY-NECK or TORTICOLLIS) is the term commonly applied to a condition of the neck in which lateral movement of the head causes great pain, and which is due to rheumatism of the muscles lying on the side of the neck, especially the sterno-mastoid. In the great majority of cases, only one side of the neck is affected, the head being drawn more or less obliquely towards that side; but occasionally both sides are equally attacked, in which case the head is kept stiffly erect and looking straight forwards. As long as the head is allowed to remain at rest, there is merely a feeling of discomfort; but every movement is extremely painful. This affection is usually caused either by exposure of the part affected to a current of cold air, or by wearing wet or damp clothes round the neck. In addition to the ordinary treatment of sub-acute Rheumatism (q. v.), heat may be advantageously employed, either, as suggested by Dr Wood of Philadelphia, by placing a batch of carded tow or cotton over the part, and then applying a hot flat-iron, or by the direct application of a small heated iron hammer, as recommended by Drs Corrigan and Day. For the method of applying this hammer, and for cases illustrative of its use, the reader is referred to the last-named physician's memoir, *On the Thermic Treatment of Lumbago and other Forms of Muscular Rheumatism.*

STIGMA. See PISTIL.

STIGMARIA, the root of Sigillaria (q. v.).

STIGMATISA'TION (Lat. *stigmatizatio*, a puncturing, from Gr. *stigma*, a puncture), the name applied, by the mystic writers of the Roman Catholic Church, to the supposed miraculous impression on certain individuals of the 'stigmata,' or marks of the wounds which our Lord suffered during the course of his Passion. These stigmata comprise not only the wounds of the hands and feet, and that of the side, received in the crucifixion, but also those impressed by the crown of thorns and by the scourging. The impression of the stigmata, being held to be miraculous, was regarded as a mark of the signal favour of our Lord, manifested to those who were specially devoted to the contemplation of his Passion. The most remarkable example of stigmatisation is that already referred to in the memoir of FRANCIS OF ASSISI (q. v.), which is said to have occurred on the mountain of Alverno, upon the 15th September 1224, two years before the death of Francis. Being absorbed, according to the account of his biographers, in profound and rapturous contemplation of the Passion of Christ, he saw, as it were, a seraph with six shining wings, blazing with fire, and having between his wings the figure of a man crucified, descend from heaven, and approach him, so as to be almost in contact. After a time, the vision disappeared, but left the soul of Francis filled with reverence and awe; and on his return to calmer thought, he became aware that his body had received externally the marks of the crucifixion. His hands and feet seemed bored through with four wounds, and these wounds appeared to be filled with nails of hard flesh, the heads of which protruded and appeared upon the palms of his hands, and on the instep, while the points protruded upon the opposite side, and seemed as if clenched with a hammer. His side, moreover, presented a red wound, as though from the point of a lance, and this wound occasionally gave forth blood. These mysterious marks continued, and were frequently seen by St Bonaventure and others during the two years which intervened between this date and the death of Francis; and they were seen by multitudes after his death.

It would be out of place here to enter into any discussion as to the origin, or the nature, of this strange phenomenon. But the case of Francis of Assisi is by no means a solitary one; very many others, women as well as men, are recorded as having received all or some of the stigmata. The cases of women so visited are more numerous than those of men. A very remarkable one is that of Veronica Giuliani, in 1694, who is related to have received first the marks of the crown of thorns, and afterwards those of the crucifixion; Gabriella da Piezolo of Aquila is recorded to have received the mark of the lance in 1472; Clara di Pugny, a Tertiary of the Dominican order, was similarly impressed in 1514; and Cecilia di Nobili of Nocera in 1655. Catherine di Raconisio is alleged to have been marked with the crown of thorns in 1583, and the same is related of several others, as Maria Razzi of the island of Chio, Maria Villani, Vincenza Ferreri of Valencia, and Joanna Maria of the Cross, a nun of St Clare, at Roveredo. In some cases, the visitation, although said to be accompanied with excruciating pain in the seat of the several wounds, was unattended by any external marks. Such was the case of St Catherine of Siena, of Ursula Aguirre —otherwise known as Ursula of Valencia—of Mary Magdalen di Pazzi, and of Mechtildis von Stanz; while in other cases the wounds were in part visible, and in part invisible. Thus, Hieronyma Carvaglio suffered the pain of the wounded hands and feet without any external mark, while the lance-wound was not only visible in her side, but was reported to bleed upon every Friday, the day specially devoted to the commemoration of the Passion. Blanca de Gazeran experienced the sensation of pain in the seat of each one of the wounds, but the mark of the nail was visible upon the right foot only. The same variety of sensation is recorded in several other cases.

Most of the cases recorded hitherto are of females; and that examples of these are not wanting even in more recent times, the case of the well-known 'Estatica' of Caldaro, which was the subject of discussion about 25 years ago, sufficiently attests. But, besides that of Francis of Assisi, instances are also recorded in which men were reputed to have received the stigmata. A Capuchin named Benedict, of Reggio, is said to have received the marks of the crown of thorns in 1602. A lay-brother named Carlo di Saeta, or Sazia, was smitten in a vision with the wound in the side. Angelo del Paz, a Franciscan of Perpignan, is related to have borne for many years all the stigmata, as also a Premonstratensian monk named Dodo, and a Franciscan called Nicholas of Ravenna. Several cases also are mentioned of men, who, without the visible or external stigmata, experienced at regular intervals the painful sensation by which the stigmata are accompanied. Many such cases are detailed by the celebrated German mystic, Görres, in his *Christliche Mystik*, vol. ii. pp. 420—456.

STILAGINA'CEÆ, a natural order of exogenous plants, allied to *Urticeæ*, containing about twenty known species of trees and shrubs, natives of the East Indies, Mauritius, and Madagascar. None of them are of importance.

STI'LBITE. See ZEOLITE.

STILICHO, a celebrated Roman general, the mainstay of the Western Empire after the death of Theodosius (q. v.) the Great, is said to have been a Vandal, and was the son of a captain of barbarian auxiliaries of the imperial army. He rose through his military talent to high rank in the army, and Theodosius was so pleased with his rare ability, zeal, and accomplished manners, that he gave him his niece Serena in marriage. S.'s promotion was, however, viewed with great jealousy by Rufinus, the able but evil-minded and ambitious minister of Theodosius, and an inextinguishable feud arose between the two, which it required all the weight of the emperor's influence to repress. In 394, S. departed for Rome in charge of the youthful Honorius (q. v.), who had been committed to his care, placed him on the throne of the Western Empire, and administered in his name the affairs of state. On the death of Theodosius, towards the close of 394, the quarrel for supremacy between S. and Rufinus, the guardian of Arcadius (q. v.), became fully developed, and Alaric (q. v.), at the instigation of the latter, invaded Greece while S. was engaged in chastising the invaders of the Roman territories on the Rhine and in Gaul. S., on his return, at once set out for Constantinople, and put an end to the struggle between himself and Rufinus by the destruction of his rival in 395. He then marched against Alaric, blocked him up in the Peloponnesus, but, through over-confidence, permitted him to escape across the isthmus with his captives and booty. In 398, his daughter Maria became the wife of Honorius. His old opponent, Alaric, after several inroads upon the eastern provinces of the Western Empire, now invaded Northern Italy, but was signally defeated at Pollentia (March 403) by S., who had hurriedly called in the Roman legions from Rhætia, Gaul, Germany, and even Britain. He was again defeated at Verona, upon which he retired from the empire, and S. obtained the honour of a triumph and a great increase of influence and power. S.'s ambition now led him to attempt the introduction of his own family to the imperial succession (a statement disbelieved by Gibbon, who considers it merely as an invention of the crafty Olympius; though the great historian of the Roman Empire honestly confesses to various heavy blots on the character of his hero), by the marriage of his son with the heir-presumptive Placidia, the daughter of Theodosius, and to attain this end, he made overtures of alliance to Alaric, which were gladly accepted. But the dreadful inroad of Radagaisus, in 406, at the head of more than 200,000 (some say 400,000) barbarians, who ravaged the whole country as far as Florence, compelled the great general of the West to shelve for a time his ambitious schemes. With a small but chosen army of veterans, aided by a body of Huns under Uldin (father of Attila), and of Visigoths under Sarus, he so harassed the invaders, that they were forced to give him battle. They were soon routed. Radagaisus, who surrendered, was put to death, and his followers sold as slaves. S. again resumed his pet scheme; established enmity between Rome and Byzantium by seizing on Eastern Illyricum and inducing Alaric to transfer his allegiance to Honorius. But Honorius, who had been prejudiced against S. by one of his officers, Olympius, refused to take Eastern Illyricum from the Byzantine Empire; and subsequently, by an artful harangue, he so influenced the soldiers of the army of Gaul, that they rose *en masse* against the partisans of Stilicho. S. himself was at Bologna; and on the news of the *émeute*, his most zealous friends urged immediate action against Olympius and the Pavian rebels; but for the first time in his life, vacillation seized S., and he declined. They then, for self-preservation, turned against him, and one of them, Sarus, the Goth above mentioned, drove him out of his camp, and compelled him to flee to Ravenna, where he was soon afterwards slain, 23d August 408. Thus perished the last of the series of distinguished aliens, who, as emperors, warriors, or politicians, had propped up the Roman Empire for 150 years, with a stern and resolute zeal equal to that of the early Romans themselves. After protecting the weak empire from formidable invasion by his own kinsmen, administering its affairs with remarkable ability, moderation, and integrity, and restoring its old heroic glory to the imperial arms, S. received the reward which alone an effete and conceited people can be expected to bestow; and three months after his death, Alaric and his Visigoths were at the gates of Rome.

STILL is the apparatus employed for the distillation of liquids, and consists of the copper boiler or *alembic* (see DISTILLATION), in which is contained the fermented liquor whose vapours are to be distilled; of the *neck* or *head*, a pipe which conveys the vapour generated in the boiler into the worm; and of the *worm*, a coiled metal tube which is packed in a vessel called a *refrigeratory*, fitted up in such a manner that the cold water which is poured in at the top comes in contact as extensively as possible with the outside of the tube, and exercises a condensing action upon the vapour which it contains. The vapour thus condensed in its passage through the worm, makes its exit in drops, or in a small stream, into a vessel called the *recipient*, and may be redistilled or not as is required. The various forms of stills are extremely numerous, almost each species of spirit possessing its own form of still, but they all conform to the general description above given.

STILLINGFLEET, EDWARD, Bishop of Worcester, was born April 17, 1635, at Cranbourne, in Dorsetshire. He received his early education at the grammar-school of his native place, and in 1648 became a student at St John's College, Cambridge. He took his degree as Master of Arts; and in 1653 succeeded in obtaining a Fellowship. For some years after leaving college, he was occupied as a private family tutor; and in 1657 he was presented to the rectory of Sutton. In 1659, he came before the world as an author in the work entitled *Irenicum, or the Divine Right of Particular Forms of Church Government examined.* The views here maintained savoured somewhat more of latitudinarianism than could be pleasant to the High Church party, and he afterwards saw reason to modify them. His next performance was the *Origines Sacræ, or Rational Account of the Christian Faith, as to the Truth and Divine Authority of the Scriptures*, a work which made his reputation, and is still had in estimation as one of the most masterly treatises extant on the subject of which it treats. In 1664, appeared his *Rational Account of the Grounds of the Protestant Religion*, a defence of the Church of England from the charge of schism in its separation from that of Rome, which was received with great favour, and led to the preferment of its author. In 1665, the Earl of Southampton presented him to the rectory of St Andrews, Holborn; he was also appointed preacher at the Rolls Chapel, and shortly after lecturer at the Temple, and Chaplain in Ordinary to Charles II. In 1670, he became, by favour of the king, Canon Residentiary of St Paul's Cathedral, and in 1678, was preferred to be Dean of the same. In the Court of Ecclesiastical Commission instituted by James II., S. declined to act; and after the Revolution of 1688, he received

in final acknowledgment of his services to the Protestant cause, his appointment to the bishopric of Worcester. He died at Westminster on 27th March 1699, and was buried in Worcester Cathedral.

S.'s chief works, besides those mentioned, were the *Origines Britannicæ, or Antiquities of the British Churches*, and a bulky volume entitled *The Unreasonableness of Separation*, in reply to an attack made upon him by Howe and others. Throughout, he was besides almost constantly engaged in religious controversy, on the one hand with the adherents of the Church of Rome, and on the other with the Nonconformists. Of his numerous polemical treatises, however important in their day, it is not here necessary to treat in detail. His collected works, in 6 vols. folio, were published in 1710; and in 1735, a supplementary volume of Miscellanies was issued by his son, the Rev. James Stillingfleet, Canon of Worcester. S., though keen and unsparing in conflict, was a good and amiable man, and his unquestioned piety and honesty of intention commanded throughout the respect even of his bitterest opponents.

STILL-LIFE is the name applied to that branch of art which concerns itself with the representation of lifeless objects, such as dead animals, fruits, flowers, vases, and house-furniture.

STILTED ARCH, an arch in which the impost moulding is placed at some distance below the springing of the arch.

STI'MULANTS may be defined to be agents which produce a sudden but not a permanent augmentation in the activity of the vital functions. They give increased energy to the circulatory and cerebro-spinal nervous systems, the primary effect being probably on the nervous system, while the circulation is only secondarily affected. In their mode of action they resemble Tonics (q. v.) in some respects; thus immediately after their administration a feeling of increased power is produced, which, however, is not permanent, and is almost always followed by a corresponding depression of vital power; their effects are, however, more immediate than those of tonics. Many of these agents, as, for example, alcohol and the ethers, are closely allied to narcotics, their secondary effect, if given in sufficiently large doses, being to produce sleep, and even coma. The following are the most important of the general stimulants. 1. *Alcohol*, in the various forms of spirits and wines. As a stimulant, alcohol is employed in medicine to support the vital powers in the advanced stages of fevers, particularly those of a low or typhous character; and it is of service in flatulent colic, in some forms of indigestion, in vomiting, and in fainting. Its almost universal use in inflammatory diseases occurring in persons of broken-down constitution, has recently been advocated by a special school, of which the late Dr Todd may be considered the representative. In cases of severe uterine hæmorrhage and in some forms of fever, it may be given in very large quantity. According to Neligan, in the fever which proved so fatal to the British Legion in Spain in the year 1835, some of the physicians prescribed as much as 32 ounces of brandy (a pint and a half) in 24 hours. 2. *Ammonia*, either in the form of *Solution of Ammonia*, or *Liquor Ammonia*, or as *Carbonate of Ammonia*, is a general stimulant, whose action is rapid, but temporary. It is of special use in the advanced stages of continued fever, in the eruptive fevers when the rash has receded (especially in scarlatina), and in the later stages of pneumonia. It is the best internal stimulant to employ in profound intoxication, and in cases of poisoning by sedatives; and as an external stimulant, the vapour is inhaled in cases of fainting. The solution (which must not be confounded with the *Strong Solution of Ammonia*) may be given in doses of from 5 to 30 minims, diluted with two ounces of water, mucilage, or any bland fluid. The *Carbonate* (formerly known as the sesquicarbonate, which, in reality, it is) may be given in doses varying from 3 to 10 grains in pills or in cold water. The *Aromatic Spirit of Ammonia*, containing both ammonia and its carbonate, is an excellent and agreeable stimulant in fainting, hysteria, flatulent colic, &c., in doses of from half a drachm to a drachm, taken in water or camphor mixture. 3. *Cajeput Oil*, in doses of from 2 to 6 drops on a lump of sugar, or rubbed up with sugar, is a powerful diffusible stimulant, admirably suited for cases of flatulent distention of the stomach and intestines. 4. *Ether* (known also as *Sulphuric Ether*) acts as a general diffusible stimulant; but its effects, which are rapidly produced, are very transient. It is chiefly employed as a stimulant in spasmodic and nervous affections unaccompanied by inflammation, as 'in cramp of the stomach, in spasmodic or flatulent colic, in nervous palpitations, in hiccough, in nervous headache, during a paroxysm of spasmodic asthma, in aphonia, &c. It is also administered frequently with good effect in the advanced stages of fever, when the twitching of the muscles, known as *subsultus tendinum*, and hiccough are present; and as an immediate stimulant in fainting and asphyxia.'—Neligan's *Medicines*, &c., 6th ed., p. 452. It is usually given in doses of about a drachm in some aromatic water. To these more important stimulants may be added camphor, ginger, horse-radish, the preparations of lavender, of the mints &c. It must not be forgotten that electricity, galvanism, and magnetic electricity operate on the animal system either as general or local stimulants, according to the manner in which they are applied. See ELECTRICITY, MEDICAL.

STING-FISH. See WEEVER.

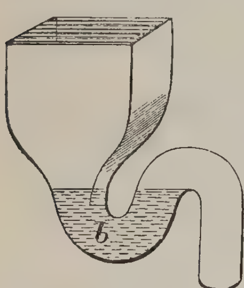
STING RAY (*Trygon*), a genus of cartilaginous fishes, of the order *Raiæ* (see RAY), and family *Trygonidæ*. In this family, the tail is long and slender, the eyes on the upper (dorsal) aspect, and in the genus *Trygon* the tail is armed with a strong spine notched on both sides. The tail has either no fin, or a merely rudimental one. Only one species of S. R. occurs in the British seas (*T. pastinaca*), popularly known as the Fire Flaire. It is found in the Mediterranean, and thence to the

Sting Ray (*Trygon pastinaca*).

northernmost parts of Europe. It resembles a skate in general appearance. The flesh is remarkable for its redness of colour, and is not esteemed. The S. R. is dreaded from the power which it has of using its muscular and flexible tail as a weapon, twisting it round the object of attack, and inflicting severe lacerated wounds with the serrated spine. These wounds often cause great inflammation, whence a notion has been prevalent from ancient times that the sting is charged with venom; but of this there is no evidence. Other species of S. R. are plentiful in the warmer parts of the world, and they are everywhere dreaded. The spine is used by the savages of the South Sea Islands to point their spears.

STINKPOT, in Warfare, a shell, often of earthenware, charged with combustibles, which, on bursting, emit a foul smell and a suffocating smoke. It is useful in sieges for driving the garrison from their defences; also in boarding a ship, for effecting a diversion while the assailants gain the deck. The stinkpot is a favourite weapon of the Chinese. Under the more elegant title of Asphyxiated Shell, the French and other modern nations have experimented considerably on this mode of harassing an enemy.

STINKSTONE, or SWINESTONE, a kind of marble or limestone remarkable for the fetid urinous odour which it emits when rubbed. It contains a little sulphur.



Stink-trap.

STINK-TRAPS, a name given to certain very useful forms of drain-openings, which, whilst allowing liquids to run down, prevent the escape of noxious gases. They are made of iron or earthenware, in a great variety of forms, but on one very simple principle, there being a curved or siphon pipe below the grating or grid (fig.), which always retains sufficient water, *b*, to prevent the outward passage of the gases.

STINK-WOOD (*Oreodaphne fœtida*), a tree of the natural order *Lauraceæ*, a native of the Cape of Good Hope, remarkable for the strong disagreeable smell of its wood, which, however, is hard, very durable, takes an excellent polish, and resembles walnut. It has been used in ship-building.

STINT. See SANDPIPER.

STI'PA. See FEATHER GRASS.

STIPE, in Botany, a term used to designate the stem of palms and tree-ferns.

STI'PEND, the provision for the support of the parochial clergy of the Church of Scotland. It consists of payments in money or grain, or both, made out of the teinds or tithes of their parishes. The Teinds (q. v.), originally the tenths of the produce of the lands drawn in kind, have become converted into a separate estate, held under a liability for stipend. In a majority of cases, they have been purchased at a valuation by the owners of the lands to which they belong, stipends having first been 'modified' from them, and they are held under the burden of augmenting the minister's stipend to the extent of their value. Sometimes they have passed into the hands of titulars, i. e., grantees from the crown and their successors, or belong to colleges and hospitals, to all of whom payment of tithe is made by the proprietor of the lands according to a valuation or composition; and the teinds formerly held by bishops or other dignified clergy are in the hands of the crown. In 1617, a commission was appointed by James VI. to modify stipends to the clergy from the parochial teinds. The provision was at first limited to a maximum of 10 chalders of victual or 1000 merks (£55, 11*s.* 1*d.*) *per annum*, and a minimum of five chalders or 500 merks (£27, 15*s.* 6*d.*); but the minimum was raised in 1649 to eight chalders, or three chalders and money for the other five, at a conversion not exceeding £100 Scots or beneath 100 merks for each chalder; and it has been the practice to allow a further sum to the minister to meet the expense of communion elements. The power of assigning, modifying, and localling stipends has, since the Union, been possessed by the judges of the Court of Session, sitting as a Court of Commission of Teinds. When the existing stipend of a clergyman is considered insufficient, and there remains any free teind (i. e., teind as yet unappropriated for stipend), the court have it in their power to award him out of it what augmentation they deem suitable. But by act 48 Geo. III. c. 138, no stipend can be augmented a second time till after the lapse of 20 years from a previous augmentation. The augmented stipend is modified in victual; but the minister receives it not in kind, but in value, according to the highest fiars (q. v.) prices of each year. By 50 Geo. III. c. 84, £10,000 annually was set apart from the revenue for the purpose of raising all stipends to £150, where the teinds of the parish did not provide that sum. Act 5 Geo. IV. c. 72 makes certain provisions out of the public revenue for those clergymen who have neither manse nor glebe, or who have a manse but no glebe, or a glebe but no manse, and whose stipends do not exceed £200 a year.

The terms at which stipend is payable are Whitsunday and Michaelmas. If the incumbent be admitted before Whitsunday, he is entitled to the whole year's stipend; and if his interest cease before that term, he has no claim to any part of it. If he is admitted between Whitsunday and Michaelmas, he is entitled to a half-year's stipend. If his interest cease between these terms, he or his representatives have right to a half-year's stipend; and if it cease after Michaelmas, to the whole year's stipend. No stipend is due till collation have taken place; and stipend continues due to a suspended clergyman. On the decease of a clergyman, a sum equal to a half-year's stipend is due to his executors, under the name of *ann* or *annat* (a word derived from the not altogether analogous *annatæ*, or first-fruits of the canon law), one half of which goes to the widow, and the other half to the children or other next of kin, the whole passing to the next of kin where there is no widow. It is additional to the sum otherwise due to the incumbent; so that, if he survive Whitsunday, he will have half the year's stipend, and his executors will have the other half as *ann*; and if he survive Michaelmas, he will have the whole year's stipend, and an additional half-year's stipend will be due to the executors as *ann*. The stipend accruing during a vacancy was formerly at the disposal of the patron of the parish for pious uses; but has been given by statutes 50 Geo. III. c. 84, and 54 Geo. III. c. 49, to the Ministers' Widows' Fund.

STIPULATION, in Roman Law, was an agreement attended with certain solemnities.—The word is used in English and Scotch Law only in a popular sense, to denote any distinct matter expressly agreed upon by the parties to an agreement or deed.

STI'PULE, in Botany, a leafy appendage at the base of the leaf-stalk in many plants. Sometimes the stipule is solitary; but frequently there are two, one on each side of the leaf-stalk. They are of very various form and character, often very dissimilar to the leaf with which they are connected. In some plants, they are large, enveloping the young leaf, but soon falling off; in many, they are deciduous; but in many they are as permanent as the leaf itself. Their presence or absence, their deciduous or persistent character, and other peculiarities which they exhibit, form distinctive characteristics not only of species and genera, but of natural orders. They are generally green, like leaves; but sometimes membranaceous. In some plants, they assume the form of spines; in *Cucurbitaceæ*, that of tendrils. Organs of the same nature with stipules appear at the base of the leaflets of some compound leaves.

STI'RLING, a market-town, river-port, and royal, parliamentary, and municipal burgh, capital of the county of the same name, stands on the south bank of the Forth, 29 miles north-east of Glasgow by railway. Like Edinburgh, to which city it bears, in its main features, a striking resemblance, it no doubt owes its origin to the strong natural fortress of its Castle Hill. From this Hill, covering the declivity which slopes north and eastward to the plain, extends the oldest part of the town, around which are numerous streets; while many villas have arisen in the environs. The Castle Hill, which rises gradually from the east, and fronts the west with a steep, precipitous wall of basaltic rock, overlooks the beautiful and fertile *carse*, or flat, which lies along the banks of the Forth. Among the more prominent public buildings and institutions are the East and West Churches—the former erected by James IV. about 1494, the latter built at a later period; and 'Mar's Work,' an incomplete structure, built by the Earl of Mar, Regent of Scotland, who died in 1572, when the building was in progress. This architectural fragment is richly ornamented. In the more ancient quarters, one or two pleasing specimens of old Scotch domestic architecture may still be seen. Of these, 'Argyle's Lodging,' with its pinnacled round towers and decorated windows, is the chief. It is now used as a military hospital. The town-house is surmounted with a spire, and has the old jail attached. It contains the jug or standard of dry measure which was given to the keeping of S. by the Scottish parliament; while Linlithgow is said to have received the firlot; Edinburgh, the ell; Perth, the reel; and Lanark, the pound. The new jail is a handsome and strong building. Cowan's Hospital, founded in 1639, is an object of interest. There are also an Athenæum, Corn Exchange, and numerous excellent schools. The importance of the part which S. played in early times, was due to its situation and its defences. Standing at the head of the navigation of the Forth, when no regular ferries crossed that river, S. was the key to the Highlands; and the possession of its strengths and its means of communication between north and south was of the greatest importance. The town, besides, was strongly fortified both by nature and art. The ancient bridge of S., the age of which is unknown, but which was in existence in 1571, is composed of four arches, and was defended at each end by gates and towers. This bridge was, until quite recent years, the only one by which wheeled carriages could cross the Forth. Vessels of 150 tons can reach the port of S.; but its commerce by river is now of less importance than before the days of railways. S. is a central railway station, and the means of communication in every direction are ready and abundant. The rich agricultural, mining, and manufacturing districts around are to a great extent the basis of the prosperity of the town itself. Manufactures of ropes, malt, leather, soap, and mineral oils are carried on. The town unites with the Dunfermline burghs in sending a member to the House of Commons. Pop. (1861) of parl. burgh, 13,716; of town, 10,873; of parl. burgh (1881) 16,013.

S. (formerly *Stryvelyne*, or *Estrivelin*) is one of the most ancient and historically important towns of Scotland. It is of unknown antiquity; and there is no record from which the date of the foundation of even the castle can be determined. It must have been a frontier fortress from the earliest times. Alexander I. died in the castle in 1124. In the vicinity, the battle of Stirling was fought in 1297. See WALLACE. The town was taken by Edward I., after a siege of three months, in 1304. In the vicinity, at Bannockburn (q. v.), the famous battle of that name was fought in 1314. The castle was the birthplace of James II. and of James V. James III. built the Parliament House in the Castle, and otherwise improved and embellished the fortress. James V. built the palace, the walls of which are profusely covered with grotesque ornamentation. In the older part of the Castle is the 'Douglas Room,' in which William, Earl of Douglas, was assassinated by James II. In 1651, after the battle of Dunbar, the castle was taken by Monk; and it withstood a siege by the Highlanders in 1745. The view from the towers of Stirling Castle is unsurpassed in beauty. Westward, the rich vale of Menteith stretches away to the Highlands, where Ben Lomond, Ben Venue, Ben A'an, and Ben Ledi close the scene. The glittering 'links' of Forth are seen in the Carse of Stirling, surrounded by fertile fields and luxuriant woods; the Abbey Craig, crowned by the Wallace Monument, rises boldly on the north; while on the east are seen the picturesque ruins of Cambuskenneth Abbey.

STI'RLINGSHIRE, a county of Scotland, forming the border-land between the Highlands and Lowlands of the country, is bounded on the N. by Perthshire and by the river and Firth of Forth. Area, 462 sq. m.; pop. (1881) 112,443. A considerable part of S. is occupied by the carses of Stirling and Falkirk, which were formerly covered for the most part with unproductive moss. On the removal of the moss-soil, part of which was floated off into the Forth by the agency of running water, a rich clay-soil, of various depths, from a plough-furrow to 20, and even 30 feet, was reached, and is now cultivated with the most marked success. The chief elevation is Ben-Lomond (q. v.), in the north-west. The chief rivers are the Forth (q. v.), the Carron—navigable for small vessels to Carron-shore—and the Endrick. Loch Lomond (q. v.) is the only important lake in the county. S. is remarkable for its mineral stores, especially iron-stone, which is wrought on an extensive scale at Carron (q. v.). Woollen goods, &c., are largely manufactured, especially at Alva, Bannockburn, and in the neighbourhood of Stirling (q. v.). According to the agricultural statistics taken in 1872, there were 1498 occupants. The total acreage under all kinds of crops, bare fallow and grass, was 105,073; the total under corn crops was 32,019; 3889 acres were under wheat; 5006 under barley; 19,322 under oats; 86 under rye; 3710 under beans; 4378 under potatoes; 24,601 with clover and grasses under rotation; 36,501 with permanent pasture and meadow. The returns show that in the same year there were in the county of Stirlingshire 4289 horses, 30,733 head of cattle, 122,024 head of sheep, and 2846 swine. Capital, Stirling.

STI'RRUPS (Naval) are eyes of rope pendent from the yards, and supporting certain portions of the tackle connected with the management of the sails.

STITCH in the side is the popular and expressive name applied to the pain felt in pleurisy. It occupies a point or small spot on a level with, or just beneath, the breast on the affected side; and patients state that they feel as if some sharp stabbing instrument were being driven in at that spot, whenever the act of respiration goes beyond a certain limit. It is termed in French *Point de côté*. See PLEURISY. A simple modification of stitch is by no means uncommon, if a person takes exercise shortly after partaking of a full meal. The pain in this case is seated lower in the side, and is usually removed by stooping. Hence the popular remedy for this pain is to make a cross upon the foot.

STI'TCHWORT (*Stellaria*), a genus of plants of the natural order *Caryophylleæ*, having a calyx of 5 leaves, 5 deeply-cloven petals, 10 stamens, 3 styles,

Greater Stitchwort (*Stellaria Holostea*).

and a many-seeded capsule opening with six teeth. The species are numerous, and several are very common in the United States, annual and perennial plants, with weak stems and white flowers, which in some are minute, and in others are large enough to be very ornamental to woods and hedge-banks, as in the Wood S. (*S. nemorum*) and the Greater S. (*S. Holostea*). To this genus the common Chickweed (q. v.) is now generally referred.

STI'VER, a coin of Holland, equivalent to a penny sterling, being the $\frac{1}{20}$th of a guilder or gulden. See FLORIN.

STOAT. See ERMINE.

STOCK, or STOCK GILLYFLOWER (*Matthiola*), a genus of plants of the natural order *Cruciferæ*, having cylindrical or compressed pods, and a stigma consisting of two upright appressed plates, the outer side of which often rises into a knob or horn. The species are herbaceous or half-shrubby, natives of the countries around the Mediterranean Sea, most of them thickly clothed with white or grayish stellate hairs; the flowers in racemes, and generally beautiful and fragrant. Some of the species have long been much cultivated, and many fine varieties have been produced by cultivation. *M. incana*, a very rare and even doubtful native of England, is probably the parent of the greater number of the cultivated kinds with hoary leaves, known as Brompton S., &c.; whilst those with smooth leaves, called Ten-week S., German S., &c., are referred to *M. annua*, *M. glabra*, and *M. fenestralis*, which, perhaps, are mere varieties of one species. The sandy shores of Wales and of Cornwall produce a species, *M. sinuata*, the large purple flowers of which are fragrant only at night—a characteristic also of several other species. Stocks are always raised by gardeners from seed, which even the double kinds often produce, a multiplication of the petals having taken place without loss of the parts of fructification. Of the seedlings, however, some produce double, and others single flowers, so that only some gratify the cultivator. The hoary-leaved stocks are generally treated as biennials, although, in reality, they may almost be reckoned perennial; and it is not desirable that they should flower in the first year, as the plants become stronger when they remain without flowering till the second year, and produce richer racemes of flowers. The smooth-leaved stocks are treated as annuals.—The beautiful little annual called Virginian Stock does not belong to this genus, although it is of the same natural order. Its habit is indeed very different. It is *Malcolmia maritima*, and notwithstanding its popular name, is a native of the shores of the Mediterranean. It has become one of our most favourite flowers, almost rivalling mignonette, and is all the more esteemed because it grows well in the little garden-plots which are exposed to the smoke of towns.

STOCK-FISH, a commercial name of salted and dried cod and other fish of the same family, particularly the Ling, Hake, and Torsk (see these heads). The fish is cured as soon as possible after being caught. It is split up from head to tail, cleansed from all particles of blood by plentiful washings with salt water; a piece of the back-bone is cut away; and after the superfluous water has drained off, the fish are laid in long vats, covered with salt, and kept down by heavy weights. By and by, they are taken out, washed and brushed, and then exposed to sun and air on a sandy beach or upon rocks. They are afterwards gathered into little heaps, and when they assume a fine whitish appearance, known as the *bloom*, they are considered ready for the market. Great quantities of stock-fish are thus prepared in the northern parts of the world, and are not only used in the countries which produce them, but are largely exported to more southern regions, where they are in great demand. The cod, ling, and hake fishery of Scotland is next in importance to its herring-fishery. The most productive year hitherto was 1863, which, according to the Report of the Fishery Commissioners, yielded 129,725¾ cwts. of dried fish, besides 7963¼ barrels cured in pickle. The quantity of stock-fish cured on the more southern coasts of Britain is inconsiderable.

STO'CKHOLM, the capital of Sweden, is situated at the eastern extremity of the Maelar Lake, in 59° 20′ N. lat., and 18° 5′ E. long. The pop. was in 1879, 173,433. S., which is one of the most beautiful capitals of Europe, is built partly on the continent, and partly on nine holms, or islands, lying in the channel through which the Maelar Lake discharges its waters into the Baltic, about 36 miles distant. The Helge-aand, Stads, and Riddar holms, which formed the nucleus of the ancient city, founded in 1250 by Birgir Jarl, contain some of the finest public and private buildings, among which we may instance the royal palace, built in 1753, in the Italian style, and situated on a hill, commanding a view of the romantic shores of the lake. Near the palace, which possesses good antiquarian, numismatic, and other collections, a library, gallery of paintings, large gardens, &c., is the colossal statue of Gustavus

III., on one of the fine quays which skirt the chief harbour of S.; the cathedral, or St Nicolai's; the Knights' Hall, with the adjoining market, ornamented with the fine statue of Gustavus Vasa, the Council-house, the Riddarsholm Kirke, where all the kings of Sweden since Charles X. have been buried; &c. Among the other public buildings, the most noteworthy are the Observatory, the Church of St James, the College of Surgery, and the Opera-house, with the neighbouring and corresponding palace, in the aristocratic quarter of Norrmalm, which, with the new parade-ground, its public gardens, and its fine wide and even streets, ranks as the handsomest part of the town. The most picturesque of the nine islets of S. is the Södermalm, on whose steep sides the houses, connected more frequently by steps than roads, rise in terraced rows to the even summit, which is crowned by St Catherine's Church. Numerous public gardens, summer palaces, and country-houses extend along the north-east shores of the lake, and on the margins of the Ladugaard's Holm, the central portions of which present a picturesque blending of rocks, wooded heights, and romantic glens. On this side of S. lies the famous Djurgaard, or Zoological Gardens, one of the finest public parks in Europe, which occupies a peninsula two miles long, and one mile wide, whose natural beauties have been judiciously aided by art. Stone and wooden bridges connect together the various islands of the town. The streets of the older quarters are narrow, crooked, and ill paved; but in the better parts of the town there are fine straight streets and capacious squares and open places, with well-built stone houses; while in the suburbs the houses are mostly of wood. S. is the seat of the government, and of the chief courts of law and administration, the residence of the sovereign, and the place of assembly for the legislative chambers. It is the centre of the literary and social activity of the country, and has numerous scientific, artistic, educational, and benevolent institutions. In the immediate vicinity of S. are the Karlsberg Academy, for naval and military cadets; and the Ulriksdal Hospital, for invalided soldiers. No city has more picturesque environs, or more numerous public gardens and walks, than S.; while the many channels and canals connected with its large and commodious harbours facilitate traffic and intercommunication with the interior, and with foreign ports. S. is the principal emporium of Swedish commerce; iron, timber, and deal planks are its main articles of export; but it is also the centre of an active trade in the various manufactures of the place—as, for instance, leather, cotton, woollen, and silk fabrics, glass and porcelain, iron and steel goods, steam-engines, &c., which it sends, together with the ordinary colonial and other imports, to all the other towns of Sweden.

STOCKING-FRAME. The machine with which stockings, singlet drawers, and other similar garments are woven, was first invented by William Lee of Woodbridge, Nottinghamshire. At first, it was a very simple affair, but has now become extremely complicated, although the simple principle upon which it was first originated is retained as the essential. This can only be understood by reference to the art of knitting, which originated it. In knitting, only one thread is used, and this formed into a succession of loops on a knitting-needle; each of these loops, then, has in succession another loop passed through it by means of another and similar needle, and this operation is carried on successively until the whole fabric is made. In the stocking-frame, instead of one needle to hold the stationary loops while those of the moving row are being inserted, there are as many needles as there are to be loops in the breadth of the web, and these are so made as to alternately form and give off the loops. The form of this needle is shewn in fig. 1, and

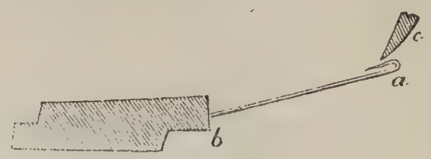


Fig. 1.

fig. 2 shews a front view of its point, in order to exhibit a small indentation, *a*, into which the bent point of the needle *a* (fig. 1), is easily pressed.

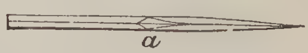


Fig. 2.

The other end of the needle is fixed into a small casting of tin, *b* (fig. 1), formed to fit into a frame and be screwed tightly in, side by side with the rest of the needles. Between the needles are placed thin plates of lead or pewter, called *sinkers* (fig. 3)

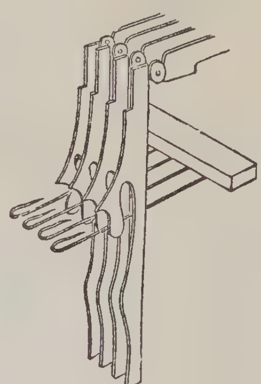


Fig. 3.

in two rows; in one row, the sinkers move freely on an axis (fig. 3); in the other, they are all fixed to a bar, and move with it. The object of the loose ones, or *jack-sinkers*, is to make loops by pressing the thread down between the needles, as shewn in figs. 4 and 5 at *a*. The other row on the bar, or

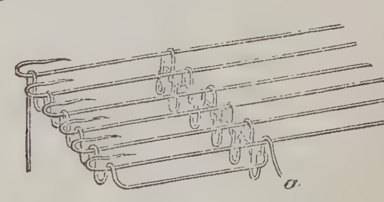


Fig. 4.

lead-sinkers, are brought down, so as to press simultaneously on the hooks of the needles, and press their points down into the little depression *a* (fig. 2), so that they will pass through the loops without catching one way, and take them up when opened and drawn in the contrary direction. The point of the lead-sinker is seen in fig. 1, *c*. These are the

essential parts of a stocking-frame, which contains so vast a number of needles and sinkers, and such nice mechanical arrangements for giving them their

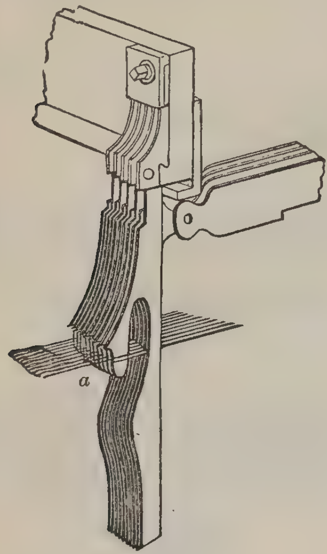


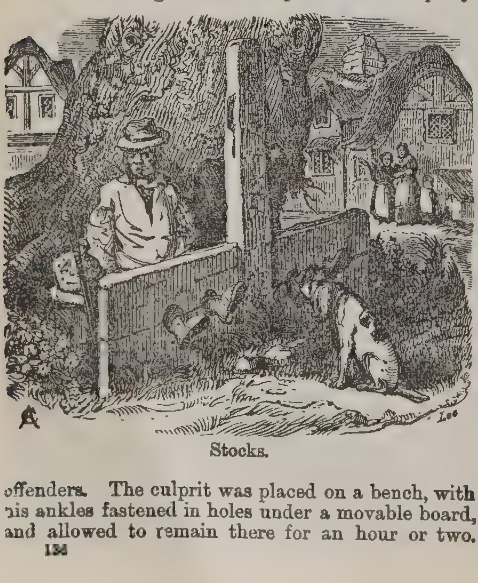
Fig. 5.

regular movements, that few machines have so complicated an appearance to the observer; and any attempt to extend this description, would only serve to puzzle rather than explain.

STOCKINGS. See HOSIERY.

STO'CKPORT, a town of England, in the county of Chester, on the river Mersey, and 6½ miles south-east of Manchester by railway. It is of great antiquity, but its prosperity is of modern date. S. has extensive manufactures of cottons, woollens, silks, machinery, brass and iron goods, shuttles, and brushes. Pop. about 60,000, who return two members to parliament.

STOCKS, an apparatus of wood, much used in former times in England for the punishment of petty



Stocks.

offenders. The culprit was placed on a bench, with his ankles fastened in holes under a movable board, and allowed to remain there for an hour or two. The period of their first introduction is uncertain, but in the second Statute of Labourers, 25 Edw. III. (1350), provision is made for applying the stocks to unruly artificers; and in 1376, the Commons prayed Edward III. that stocks should be established in every village. Each parish had in later times its stocks, usually close to the churchyard, but sometimes in a more retired spot; and in some country places they are still to be seen, and not altogethe disused. Combined with the stocks was often whipping-post for the flagellation of vagrants.

STOCKS. See FUND.

STO'CKTON, a town and port of entry of California, U. S., on Stockton Channel, near San Joaquin, 130 miles east-north-east of San Francisco. It is an important commercial point, and the entrepôt of the southern gold mines. It has three newspapers, several churches, a hospital, and pop. of 10,066.

STO'CKTON-ON-TEES, a municipal borough and seaport in the county of Durham, 11 miles east-north-east of Darlington, on the left bank of the Tees. The broad and handsome High Street is nearly a mile in length, and from it several minor streets diverge at right angles. A new town, known as South Stockton, has sprung up within the last few years on the right bank of the river. The town contains two churches, a Roman Catholic chapel built by Pugin, several dissenting chapels, an athenæum, and other important edifices. The Stockton Races, of some mark in the sporting world, are held here annually. Ship-building, chiefly in iron, is carried on to a great extent; and blast-furnaces, foundries, engine-works, and extensive potteries and iron-works are in operation. Sail-cloth, ropes, linen, and diapers are manufactured; and there are breweries, corn-mills, and spinning-mills. The exports are chiefly iron and earthenware; the imports are corn, timber in deals, spars, &c., and bark. In 1869, 885 foreign and coasting vessels of 105,701 tons entered and cleared the port, 727 being British and 158 foreign. The town is connected with the whole railway system of England and Scotland by the North-eastern Railway Company's branches, and there are two stations here. The Stockton and Darlington Railway, the first in the United Kingdom to commence passenger traffic, was opened for the double purpose of the conveyance of passengers and goods, September 27, 1825. At S. the Tees is navigable for vessels of large tonnage; the distance from the town to the sea has recently been shortened three miles, the navigation of the river much improved, and great facilities for an extensive trade provided. Pop. (1800) 3666; (1861) 13,357; (1881) 41,040.

S. suffered severely from the incursions of the Scots in the early part of the 14th c., but even at that time it enjoyed considerable trade. It was taken for the Parliament in 1644, and totally destroyed by the Roundheads in 1652. At the Restoration it had become so poor a place that it contained only 120 houses, and most of these were built of clay. Pop. of parliamentary borough (1881) 55,446.

STOICS, the name for the sect of ancient moralists opposed to the Epicureans in their views of human life. The Stoical system dates from the end of the 4th c. B. C.; it was derived from the system of the Cynics, whose founder, Antisthenes, was a disciple of Socrates. Indeed, the doctrines, but still more the manner of life, and most of all the death, of Socrates, were the chief foundations of the Stoical philosophy.

The founder of the system was ZENO, from Cittium in Cyprus (he lived from 340—260 B. C.),

who derived his first impulse from Crates the Cynic. He opened his school in a building or porch, called the *Stoa Pœcile* ('Painted Porch') at Athens, whence the origin of the name of the sect. Zeno had for his disciple CLEANTHES, from Assos in the Troad (300—220 B.C.), whose *Hymn to Jupiter* is the only fragment of any length that has come down to us from the early S., and is a remarkable production, setting forth the unity of God, his omnipotence, and his moral government. CHRYSIPPUS, from Soli in Cilicia (280—207 B. C.), followed Cleanthes, and, in his voluminous writings, both defended and modified the Stoical creed. These three represent the first period of the system. The second period (200—50 B. C.) embraces its general promulgation, and its introduction to the Romans. Chrysippus was succeeded by ZENO of Sidon, and DIOGENES of Babylon; then followed ANTIPATER of Tarsus, who taught PANÆTIUS of Rhodes (died 112 B.C.), who, again, taught POSIDONIUS of Apamea, in Syria. (Two philosophers are mentioned from the native province of St Paul, besides Chrysippus—Athenodorus, from Cana in Cilicia; and Archedemus, from Tarsus, the apostle's birthplace. It is remarked by Sir A. Grant, that almost all the first S. were of Asiatic birth; and the system itself is undeniably more akin to the oriental mind than to the Greek.) Posidonius was acquainted with Marius and Pompey, and taught Cicero; but the moral treatise of Cicero, *De Officiis*, is derived from a work of Panætius. The third period of Stoicism is Roman. In this period we have Cato the Younger, who invited to his house the philosopher Athenodorus; and, under the Empire, the three Stoic philosophers whose writings have come down to us—SENECA (6 B. C.—65 A. D.), EPICTETUS (60—140 A. D.), who began life as a slave, and the Emperor MARCUS AURELIUS ANTONINUS (121—180 A. D.). Stoicism prevailed widely in the Roman world, although not to the exclusion of Epicurean views.

The leading Stoical doctrines are given in certain phrases or expressions, as 'Life according to Nature,' the ideal 'Wise Man,' 'Apathy' or equanimity of mind, the power of the 'Will,' the worship of 'Duty,' the constant 'Advance' in virtue, &c. But perspicuity will be best gained by considering the *Moral* system under four heads—the Theology; the Psychology or theory of mind; the theory of the Good or human happiness; and the scheme of Virtue or Duty.

I. Their Theological doctrines comprehended their system of the Universe, and of man's position in it. They held that the Universe is governed by one good and wise God, together with inferior or subordinate deities. God exercises a moral government; under it the good are happy, while misfortunes happen to the wicked. According to Epictetus, God is the father of men; Antoninus exults in the beautiful arrangement of all things. They did not admit that the Deity intermeddled in the smaller minutiæ; they allowed that omens and oracles might be accepted as signs of the foreordained arrangement of God. They held this foreordination even to the length of fatalism, and made the same replies, as have been given in modern times, to the difficulty of reconciling it with Free-will, which in their system was unusually prominent. As to the existence of evil, they offered explanations such as the following: God is the author of all things except wickedness; the very nature of good supposes its contrast evil, and the two are inseparable, like light and dark, which may be called the argument from Relativity; in the enormous extent of the Universe, some things must be neglected; when evil happens to the good, it is not as a punishment, but as connected with a different dispensation; parts of the world may be presided over by evil demons; what we call evil may not be evil.

Like most other ancient schools, the S. held God to be corporeal like man; Body is the only substance; nothing incorporeal could act on what is corporeal; the First Cause of all, God or Zeus, is the primeval fire, emanating from which is the soul of man in the form of a warm ether.

It is for human beings to recognise the Universe as governed by universal Law, and not only to raise their minds to the comprehension of it, but to enter into the views of the Creator, who must regard all interests equally; we are to be, as it were, in league with him, to merge self in the universal Order, to think only of that, and its welfare. As two is greater than one, the interests of the whole world are infinitely greater than the interests of any single being, and no one should be satisfied with a regard to anything less than the whole. By this elevation of view, we are necessarily raised far above the consideration of the petty events befalling ourselves. The grand effort of human reason is thus to rise to the abstraction or totality of entire Nature; 'no ethical subject,' says Chrysippus, 'could be rightly approached except from the preconsideration of entire Nature, and the ordering of the whole.'

As to Immortality, the S. precluded themselves, by holding the theory of the *absorption* of the individual soul at death into the divine essence; but, on the other hand, their doctrine of advance and aspiration is what has in all times been the main natural argument for the immortality of the soul. For the most part, they kept themselves undecided as to this great doctrine, giving it as an alternative, reasoning as to our conduct on either supposition, and submitting to the pleasure of God in this as in all other things.

In arguing for the existence of Divine power and government, they employed what has been called the argument from Design, which is as old as Socrates. Man is conscious that he is in himself an intellectual or spiritual power, from which, by analogy, he is led to believe that a greater power pervades the universe, as intellect pervades humanity.

II. Next, as to the Constitution of the Mind. We have bodies like animals, but reason or intelligence like the gods. Animals have instinctive principles of action; man alone has a rational, intelligent soul. According to Antoninus, we come into contact with Deity by our intellectual part, and our highest life is thus the divine life.

But the most important Stoical doctrine respecting the nature of man is the recognition of Reason as a superior power or faculty that subordinates all the rest—the governing intelligence. (Very nearly the same phraseology is used by Bishop Butler in setting forth the supremacy of Conscience.) This, however, is not a mere intellectual principle, but an active force, uniting intellect and will. The bodily sensibilities are opposed to this higher Reason and Will, which, however, is strong enough to control them. Another way of expressing the same view was the power of the Mind over the Body, which was dwelt upon by Epictetus in the most exaggerated form. The introduction of so glaring a mistake, as that sickness may affect the body without enfeebling the mind, could only end in practical failures, or else in contradiction.

In order to maintain their contrast with the Epicureans, the S. said that pleasure and pain are not principles of Nature; by which they must have meant that humanity is not in fact, at least exclusively, governed by these, and that, in the regenerated man, they are not governing principles at all. Now, it is true, and a truth important for many

practical purposes, that we are sometimes impelled to action without reference to our pleasures and pains; our habits often exemplify this state; it is still better shewn in what are called 'fixed ideas,' as in involuntary imitation and sympathy. But these are exceptions; and any system that sets itself against the main fact, that pleasure and pain are the great moving forces of mankind, must somewhere or other contradict itself.

In Seneca, we find something very closely approaching to the Christian doctrine of the corruption of human nature. The littleness of humanity was a favourite theme of Antoninus, and naturally followed from the Stoical mode of contemplating the Universe at large.

The doctrine called the Freedom of Will may be said to have originated with the S., although with them it was chiefly a rhetorical mode of expressing the dignity of the Wise Man, and his power of rising superior to circumstances.

To prepare the way for the Stoical precepts, Epictetus distinguished between things in our power and things not in our power. The things in our power are our opinions and notions about objects, and all our affections, desires, and aversions; the things not in our power are our bodies, wealth, honour, rank, authority, &c., and their opposites. The application is this: wealth and high rank may not be in our power, but we have the power to form an *idea* of these—namely, that they are unimportant, whence the want of them will not grieve us. A still more pointed application is to death, whose force is entirely in the idea.

III. We must consider next the Stoical Theory of Happiness, or rather of the Good, which with them was not identified with happiness. They began by asserting that happiness is not necessary, and may be dispensed with, and that pain is no evil, which, however, if followed consistently, would dispense with all morality and all human endeavour. Substantially and practically, they held that pains are an evil, but, by a proper discipline, may be triumphed over. They disallowed the direct and ostensible pursuit of pleasure as an end (the point of view of Epicurus), but allured their followers partly by promising them the victory over pain, and partly by certain enjoyments of an elevated cast that grew out of their plan of life.

Pain of every kind, whether from the casualties of existence, or from the severity of the Stoical virtues, was to be met by a discipline of endurance, a hardening process, which, if persisted in, would succeed in reducing the mind to a state of Apathy or indifference. A great many reflections were suggested in aid of this education. The influence of exercise and repetition in adapting the system to any new function. was illustrated by the Olympian combatants, and by the Lacedæmonian youth who endured scourging without complaint. Great stress was laid on the instability of pleasure, and the constant liability to accidents; whence we should always be anticipating and adapting ourselves to the worst that could happen, so as never to be in a state where anything could ruffle the mind. It was pointed out how much might still be made of the worst circumstances—poverty, banishment, public odium, sickness, old age—and every consideration was advanced that could 'arm the obdurate breast with stubborn patience, as with triple steel.'

It has often been remarked that such a discipline of endurance was peculiarly suited to the unsettled condition of the world at the time, when any man, besides the ordinary evils of life, might in a moment be sent into exile, or sold into slavery. Moreover, it is a discipline adapted to a certain class of dispositions existing in all ages—the men that prefer above all things 'equanimity' of mind, and would rather dispense with great occasional pleasures than risk their state of habitual composure.

Next to the discipline of endurance, we must rank the complacent sentiment of Pride, which the Stoic might justly feel in his conquest of himself, and in his lofty independence and superiority to the casualties of life. The pride of the Cynic, the Stoic's predecessor, was prominent and offensive, shewing itself in scurrility and contempt towards everybody else; the Stoical pride was a refinement upon this, but was still a grateful sentiment of superiority, which helped to make up for the surrender of indulgencies. It was usual to bestow the most extravagant laudation on the 'Wise Man,' and every Stoic could take this home to the extent that he considered himself as approaching that great ideal.

The last and most elevated form of Stoical happiness was the satisfaction of contemplating the Universe and God. Epictetus says that we can discern the providence that rules the world, if we possess two things—the power of seeing all that happens with respect to each thing, and a grateful disposition. The work of Antoninus is full of studies of Nature in the devout spirit of 'passing from Nature to Nature's God;' he is never weary of expressing his thorough contentment with the course of natural events, and his sense of the beauties and fitness of everything. Old age has its grace, and death is the becoming termination. This high strain of exulting contemplation reconciled him to that complete submission to whatever might befall, which was the essential feature of the 'Life according to Nature.'

IV. The Stoical theory of Virtue is implicated in their ideas of the Good, now described.

The fountain of all virtue is manifestly the life according to nature, as being the life of subordination of self to more general interests—to family, country, mankind, the whole universe. If a man is prepared to consider himself absolutely nothing in comparison with the universal interest, and to regard it as the sole end of life, he has embraced an ideal of virtue of the loftiest order. Accordingly, the S. were the first to preach what is called 'Cosmopolitanism;' for although, in their reference to the good of the whole, they confounded together sentient life and inanimate objects—rocks, plants, &c., solicitude for which was misspent labour—yet they were thus enabled to reach the conception of the universal brotherhood of mankind, and could not but include in their regards the brute creation. They said: 'There is no difference between Greeks and Barbarians; the world is our city.' Seneca urges kindness to slaves, for 'are they not men like ourselves, breathing the same air, living and dying like ourselves?'

The Epicureans declined, as much as possible, interference in public affairs, but the Stoical philosophers all urged men to the duties of active citizenship. Although there had been many good and noble men among the pagans, yet positive beneficence had not been preached as a virtue before the Stoics. They adopted the four Cardinal Virtues (Wisdom, or the Knowledge of Good and Evil; Justice; Fortitude; Temperance) as part of their plan of the virtuous life, the life according to nature. Justice, as the social virtue, was placed above all the rest. But most interesting to us are the indications of the idea of Beneficence. Epictetus is earnest in his exhortations to forgiveness of injuries. Antoninus often enforces the same virtue, and suggests considerations in aid of the practice of it; he contends as strongly as Butler and Hume for the existence of a principle of pure, that is, unselfish,

benevolence in the mind; in other words, that we are made to advance each other's happiness.

There is also in the Stoical system a recognition of duties to God, and of morality as based on piety. Not only are we all brethren, but also the 'children of one Father.'

The extraordinary stress put upon human nature by the full Stoic ideal of submerging self in the larger interests of being, led to various compromises. The rigid following out of the ideal issued in one of the Paradoxes, namely that all the actions of the wise man are equally perfect, and that, short of the standard of perfection, all faults and vices are equal; that, for example, the man that killed a cock without good reason was as guilty as he that killed his father. This has a meaning only when we draw a line between spirituality and morality, and treat the last as worthless in comparison of the first. The later S., however, in their exhortations to special branches of duty, gave a positive value to practical virtue, irrespective of the ideal.

The idea of Duty was of Stoical origin, fostered and developed by the Roman spirit and legislation. The early S. had two different words for the 'suitable' (*kathēkon*) and the 'right' (*katorthōma*); although it is a significant circumstance that the 'suitable' is the lineal ancestor of our word 'duty' (through the Latin *officium*).

It was a great point with the Stoic to be conscious of 'advance,' or improvement. By self-examination, he kept himself constantly acquainted with his moral state, and it was both his duty and his satisfaction to be approaching to the ideal of the perfect man. When renouncing the position of 'wise,' he yet claimed to be advancing. This idea, familiar to the modern world, was unknown to the ancients before the Stoics. It is very illustrative of the unguarded points and contradictions of Stoicism, that contentment and apathy were not to permit grief even for the loss of friends. Seneca, on one occasion, admits that he was betrayed by human weakness on this point. On strict Stoical principles, we ought to treat the afflictions and the death of others with the same frigid indifference as our own; for why should a man feel for a second person *more* than he ought to feel for himself, as a mere unit in the infinitude of the Universe? This is the contradiction inseparable from any system that begins by abjuring happiness as the end of life. We may be allowed to regard our own happiness as of no importance, but if we apply the same measure to happiness in general, we are bereft of all motives to benevolence; and virtue, instead of being set on a loftier pinnacle, is left without any foundation.

The Stoical system has largely tinctured modern ages, in spite of its severity. It has always had a charm as an ideal, even when men were conscious of not realising it. It may be still considered as a grand experiment in the Art of Living, from which valuable lessons have resulted; just as a believer in Alchemy, or in the Perpetual Motion, might make useful experimental discoveries. The limitation of wants, the practice of contentment, the striving after equanimity, the hardening of one's self against the blows of fortune, are all familiar to the moralists of later ages. A qualified form of the subordination of self to the general welfare, belongs to the modern theories of virtue.

The chief ancient authorities on the Stoics are the writings of Epictetus, Marcus Antoninus, and Seneca, themselves Stoical philosophers, together with notices occurring in Cicero, Plutarch, Sextus Empiricus, Diogenes Laertius, and Stobæus. The completest modern account of the system occurs in Zeller's *Philosophie der Griechen*, vol. iii. See also an article by Sir Alexander Grant in the *Oxford Essays* for 1858.

STOKE-UPON-TRENT, a parliamentary borough, and manufacturing town of Staffordshire, 145 miles from London by the London and North-western Railway. The 'district' of S. consists of the parish, 10,490 acres in extent, is familiarly named the 'Potteries,' and contains the towns of Burslem, Hanley, Lane-End (with Longton), Stoke, and Tunstal Court. The town of S. is regularly built, and contains many modern houses. Its church, an edifice in modern Gothic, is surmounted by a tower 112 feet high. The earthenware manufactures of the parish of S. are carried on in about 200 factories. In the vicinity are numerous coal-mines. Pop. of parliamentary borough, which sends two members to the House of Commons (1881), 152,457; of the town, 19,263.

STOKES, George Gabriel, one of the greatest living mathematicians and natural philosophers in Europe, was born, in 1819, at Skreen, County Sligo, Ireland; educated at the school of the Rev. R. H. Wall, D.D., Dublin; afterwards at the Bristol College. He entered Pembroke College, Cambridge, in 1837; graduated in 1841, as Senior Wrangler, and First Smith's Prizeman; became Fellow of Pembroke in the same year; and was elected, in 1849, to fill, as one of the worthiest of Newton's successors, the Lucasian Chair of Mathematics in Cambridge. In 1854, he was appointed Secretary to the Royal Society.

He is best known, popularly, by his beautiful discovery of Fluorescence (see Phosphorescence). His paper *On the Change of the Refrangibility of Light*, is printed in the *Philosophical Transactions* for 1852—1853. His recent important physiological application of optical methods to the study of the oxidation of the blood, is noticed under Spectrum. But to mathematicians and natural philosophers, S. is known by a number of admirable papers in the *Cambridge Philosophical Transactions*, the *Cambridge and Dublin Mathematical Journal*, and the *Philosophical Magazine*. In them he has greatly extended and improved the mathematical treatment of questions connected with the distortion of elastic solids, the motion of waves in water, the undulatory theory of light, the summation of series, the internal friction of fluids, &c. But to render intelligible to the general reader the nature of what he has done for even *one* of these subjects, would require more space than is allowed us. His *Report on Double Refraction* was published in the British Association Reports for 1862. In 1869 he was president of the British Scientific Association.

STOLBERG, Christian, Count von, a German poet, born at Hamburg, October 15, 1748. He belonged to one of the oldest German families, originally of Thuringia, and which is mentioned in authentic documents of the 11th century. S. studied at Göttingen from 1769 to 1774, where he was one of a distinguished literary circle in North Germany, embracing Boje, Bürger, Miller, Voss, Hölty, and Leisewitz. In 1777, he married Luise, Countess of Reventlow, whom he had previously celebrated in his verses; and after 1800, lived apart from public life on his estate of Windebye, near Eckernförde in Slesvig, where he died January 18, 1821. As a poet, he was inferior in genius to his younger brother, but his pictures of family life are very fine. His principal works are *Gedichte* (Leip. 1779); *Gedichte aus dem Griechischen* (Hamb. 1782); *Schauspiele mit Chören* (Leip. 1787); and *Vaterländischen Gedichte* (along with his brother; Hamb. 1815).

STOLBERG, Friedrich-Leopold, Count von.

younger brother of the preceding, was born at Bramstedt, November 7, 1750, studied at Halle and Göttingen, and after a visit to Switzerland and Italy, in the course of which he made the acquaintance of Goethe at Frankfurt, and of Lavater at Zürich, he became, in 1777, minister-plenipotentiary of the episcopal Prince of Lübeck at the court of Denmark. S. filled various other official situations in the course of his public life; but becoming a convert to Roman Catholicism, he resigned all his employments, and henceforth lived mainly in the society of his co-religionists. The causes that led him to take a step which lost him many old and dear friends, were partly the theological strifes between the Rationalists and orthodox Lutherans in Holstein—the country where he mostly resided, and partly his study of the controversial works of the Catholic writers during a second visit to Italy in 1790—1791. He died at Sondermühlen, near Osnabrück, December 5, 1819. S. is a superior poet to his elder brother. There is greater boldness in his ideas and imagery, and he displayed a wonderful facility in versification. We have from him specimens of all sorts of poetry, songs, odes, elegies, metrical romances, satires, descriptive verse, and dramas, which are contained in the *Werke der Brüder Stolberg* (22 vols., Hamb. 1821—1826). See *Friedr.-Leopold, Graf zu Stolberg*, by Nicolovius (Mainz, 1846). A very good account of S.'s change of faith, and of that literary circle of North Germany in which he moved until his conversion, will be found in a book called *Entiner Skizzen* (Sketches of Entin), by Wilhelm von Bippen (Weimar, 1862).

STOLE (Gr. *stolē*, Lat. *stōla*, a robe) is the name of one of the sacred vestments used in the Latin Church, and with some modification, in the Greek Church also. It originated in a wide and flowing robe of linen, called also *orarium*, which hung from the shoulder, and which had a narrow embroidered border of a different colour, as we learn from St Ambrose's sermon on the death of Satyrus (n. 43), and from Jerome's letter to Nepotianus (Ep. 52). The present stole seems to be the traditionary representative of the embroidered border of the orarium in the Roman Catholic Church, and consists of a narrow band of silk or precious stuff, edged and fringed with gold or embroidery. It is worn over the shoulders by priests and deacons, but in a different fashion—the former wearing it over both shoulders, with the ends hanging in front, or crossed upon the breast; the latter carrying it only from the left shoulder to the right side, where the pendent ends are fastened. In the Eastern Church the stole is worn pendent, over both shoulders by priests, over the left shoulder only by deacons. The stole is worn at mass, and in the administration of sacraments, in certain blessings, and in more solemn forms of preaching. It is also used, in some cases, as a symbol of jurisdiction, in which sense it is constantly worn by the pope, even when not officiating; and there is a very remarkable usage in Italy and other Catholic countries, illustrative of the same principle as to jurisdiction, of the parish priest, after he has administered extreme unction to a sick person, *leaving the stole upon the foot of the bed, not to be withdrawn until the death or recovery of the invalid.* Like the other sacerdotal vestments, the stole must be blessed by a bishop, or a priest delegated by a bishop. In the English Church the stole is now generally used by the clergy, and is worn with the same difference by priests and deacons. In the case of dignitaries, doctors, and chaplains of noblemen or bishops, it is worn in the form of a scarf. The use of the stole in the English Church appears to rest only upon ancient custom, as it is not specified in any rubric or canon. It is usually of black silk, fringed at the ends, with sometimes crosses embroidered.

STOLEN GOODS, in point of Law, stand in this situation in England: a *bonâ fide* purchaser of such goods, who has not bought them in market overt, is bound to restore them to the true owner; but if the goods are sold in market overt, the purchaser is entitled to keep them, unless the owner has duly prosecuted and convicted the thief. Market overt means the open market in towns and places where a legal market is held, and the old doctrine was, that as all sales were conducted by exposure of goods in an open place, the owner of the lost goods was likely to find them easily by going to the nearest market—a doctrine which is now quite inapplicable to modern habits. In the City of London, every shop is held to be a market overt within the above rule, but this only applies to the City proper, and not the suburbs and western parts of the metropolis. The above rule, as to stolen goods, does not apply to valuable securities which are stolen, if the security has been paid or discharged *bonâ fide* by the person liable, or if the security is a negotiable instrument, and it have been *bonâ fide* transferred or delivered for a just and valuable consideration, without any notice, and without any reasonable cause to suspect that the same had been obtained by felony or misdemeanour. The law is obviously harsh as regards owners, for a man who has had the misfortune to have his goods stolen, must go to the further loss and expense of prosecuting the thief before he can recover them.—In the law of Scotland, it is otherwise. The owner has not only an action against the thief, but against third parties, whether they have bought them or taken them in pledge *bonâ fide* or not. But as to bank-notes, and bills payable to bearer, or blank indorsed, the property in these passes with the possession, and the real owner cannot vindicate them against one who has *bonâ fide* acquired them in the course of trade. As to giving reward for recovery of stolen goods, see REWARD, also RESTITUTION.

STO'LPE, a garrisoned town of Prussia, province of Pommern, and government of Cöslin, is situated on the river Stolpe, about 15 miles from its mouth, and 40 north-east of Cöslin. S., which is composed of an old and new town, with four suburbs, has a castle, 4 churches (one of which, the *Marienkirche*, built in 1311, has a tower nearly 190 feet high), a hospital for invalids, amber and other manufactures, and an active general trade. Pop. (1880) 21,599.—At the mouth of the river lies Stolpmünde (pop. 1118), the port of S., which carries on some ship-building and commerce.

STOMACH. The Anatomy and Physiology of this organ are treated of in the article DIGESTION (q. v.).

STOMACH, DISEASES OF. In the discussion of the diseases of any organ, it is customary to begin with the consideration of its inflammation. In the stomach, however, acute *gastritis*, or inflammation of the mucous membrane of that organ, is so rare a disease, except as a result of the administration of an irritant poison, that it might almost pass unnoticed. Thus Louis states that during six years' experience at La Charité (one of the leading Parisian hospitals), in which he made notes of 6000 cases of disease, and 500 dissections, he did not meet with a single case of fatal idiopathic (or spontaneous) gastritis. The simple fact, however, that this disease is almost always the result of poison, gives it a special interest, and renders it especially necessary that the physician should be so thoroughly acquainted with its symptoms, as to be able with

certainty to detect it, and thus to be led to investigate its cause.

The symptoms which indicate that an irritant poison has been received into the stomach, are a gradually increasing sensation of uneasiness or heat, which shortly assumes an acute burning character in the epigastric region. This pain is accompanied with vomiting, which becomes increasingly frequent as the pain augments, and often with hiccup. There is usually extreme tenderness on pressure, and the patient bends his body forward to relax the muscular tension. During the accession of these symptoms, there is a marked degree of excitement, as indicated by the acceleration of the pulse and breathing, and the heat of the skin. This condition is, however, soon exchanged for one of prostration. The skin becomes cold and clammy, the pulse thready and feeble, and the breathing catching and intermittent; until finally, after a variable period of exhaustion, the patient sinks, usually retaining his mental faculties to the last. Although the above-described symptoms are always more or less present, each irritant poison occasions some special symptom, and some characteristic lesion; and the period at which death ensues varies for different poisons. Hence, quite apart from the results of analysis, a fair conjecture can usually be made as to the individual poison which has been administered.

Sub-acute gastritis is by no means a rare affection, and it occurs in two distinct forms—'one in which the malady is caused by a constitutional state, the effects of which are shewn in a variety of other organs, as well as in the stomach; another in which it is due to causes connected chiefly or exclusively with this organ, which is submitted to an irritative process somewhat analogous to that typified by the gastritis of irritant poisoning.'—Brinton, *On Diseases of the Stomach*, 1859, p. 101. The first of these forms is well illustrated in certain cases of scarlatina, in which, if death takes place between the third and seventh day of the disease, distinct marks of inflammation are seen in the stomach. The other variety, which is often of a chronic form, is best seen in cases of delirium tremens; the affection being sub-acute or chronic, according as it has been produced by a single prolonged debauch, or by a protracted habit of drinking spirits; the patient's final malady being induced by a deficiency of food, or the want of the ordinary stimulant. Purely chronic inflammation may be induced by various causes, of which the most common are the abuse of alcoholic drinks, habitual excess in eating, the eating of indigestible food, and the excessive use of irritating medicines.

The treatment of gastritis varies so much with each individual case, that we shall only lay down a few general principles. The first point is the removal of the cause; to be attempted in cases of irritant poisoning, either by the removal of the poison (by the stomach-pump or emetics, as, for example, sulphate of zinc), or by its neutralisation by means of an antidote. In very severe cases, leeches may be applied to the epigastrium; but counter-irritants, such as turpentine on a hot moist flannel, or mustard-poultices, are generally of more service. Continuous fomentation with water, as hot as can be borne, often gives great relief; while at the same time iced water, or small lumps of ice swallowed whole, usually relieve the thirst and mitigate the pain. Enemata of purgative materials, if the bowels are constipated, or of a soothing character (as thirty drops of laudanum in a little starch or gruel), if the bowels are irritable, may be prescribed with advantage. When the stomach begins to be able to retain food it must be given in the form of a bland liquid, in small doses, at distant intervals. Chronic gastritis must be treated in much the same manner as Indigestion (q. v.). The most essential point of treatment is the due regulation of the diet.

Ulcer of the stomach is the most important of the idiopathic diseases of that organ, both from its frequency, from the facility with which it may be detected during life, from the fact that at any period of its protracted course it may prove suddenly fatal, and from its being usually curable. The first and most characteristic symptom of this disease is pain, which commences as a mere dull feeling of weight or tightness, then gradually augments into a burning sensation, and at last assumes a gnawing character, and occasions a kind of sickening depression. This pain comes on in from two to ten minutes after the ingestion of food, and lasts for an hour or two; vomiting often ensues, after which the pain ceases. The place of its most common appearance and greatest intensity is the centre of the epigastric region, or slightly below the free end of the ensiform cartilage of the sternum; and the painful spot is usually of a circular form, with a diameter varying from one to two inches. The pain in this region is succeeded, in the course of a few weeks, by a gnawing pain in the back, ranging in position from the eighth dorsal to the second lumbar vertebra, and most commonly lying between the two shoulder-blades. The pain in both the epigastric and the dorsal region is almost always much increased by pressure; it is also specially affected by certain kinds of food and drink, being increased by the ingestion of hard and indigestible substances, and lessened by a bland and pulpy diet. As a general rule, the pain is aggravated by tea, beer, and hot food; although exceptions occasionally occur. The next symptom in this disease is vomiting or regurgitation, expelling the food previously taken, or a glairy alkaline fluid. The vomiting usually occurs when the pain is most intense, and is a dangerous symptom, since it tends to starve the patient, and to increase the fatigue of an already weakened frame. At this stage, the disease is sometimes terminated by the occurrence of perforation, ending in rapidly fatal peritonitis; and if this accident does not occur, the dyspeptic symptoms become complicated by hæmorrhage from the stomach, sometimes so rapid that it distends the stomach and adjacent small intestine with a single gush, and causes fainting and almost immediate death; but more commonly occurring as a slow and intermittent drain of blood, giving rise to anæmia. If death from the above causes (inanition, perforation, or hæmorrhage) does not terminate the disease, the symptoms frequently subside in something like the inverse order in which they occurred, and recovery, often after many years' suffering, ensues. With regard to frequency of ulcer of the stomach, Dr Brinton, who has carefully studied this disease, states that this lesion may be detected in (on an average) 5 per cent. of persons dying from all causes; that it occurs twice as frequently in females as in males, and that it is specially a disease of middle and advancing life—27 being the average age in females, and 42 in males. Nothing is known with certainty regarding the causes of this disease, except that advancing age, privation, mental anxiety, and intemperance so frequently coincide with it, that they may be regarded in some degree as producing it. In relation to treatment, strict attention to diet is of the first importance. When the symptoms are urgent, the patient should maintain the recumbent position, and should be fed on lukewarm milk, thickened with biscuit-powder, given in doses of

one, or, at most, two table-spoonfuls every two hours. The pain is often relieved by the application of a mustard-poultice to the painful spot; and benefit is frequently derived from the internal administration of bismuth (in doses of ten grains), either given alone or combined with the compound kino powder (in five-grain doses). When there is hæmorrhage, small lumps of ice may be swallowed; and if all food is rejected by vomiting, beef-tea injections must be thrown into the lower bowel. Aperients are sometimes required, but they must be given with caution; and if castor-oil can be taken without increasing the pain or vomiting, it is the most harmless remedy of its class.

Cancer of the stomach is a disease of much interest, from its being obscure in its symptoms and difficult of detection in its early stage, frequent in its occurrence, and always fatal in its termination. The typical course of this disease is graphically sketched by Dr Brinton in the following paragraph: 'An elderly person perhaps hitherto free from dyspepsia, begins to suffer from a capricious, and soon a diminished appetite; which is by and by associated with occasional nausea, or even vomiting, and with a sense of uneasiness or distention of the stomach. His complexion, already pale and unwholesome, next acquires a muddy, yellowish, or faint greenish hue. His gastric symptoms now increase; often by a sudden and marked augmentation, which corresponds to what is in other cases their first appearance. Vomiting, if already present, becomes more frequent and urgent; local uneasiness deepens into pain; and both these symptoms are excited or increased by taking food. At a somewhat later period, hæmorrhage generally occurs, usually but scanty in amount, and therefore depending to a great extent on casual circumstances for its detection. About this time, a tumour often becomes perceptible near the middle of the epigastric region of the belly. As the local symptoms increase, the cachexia of the patient also augments; and is evidenced not only by the colour already mentioned, but also by debility and emaciation; and at last by prostration, which ends in anasarca, delirium, and death.'—*Op. cit.*, p. 225. From the records of 600 cases, Dr Brinton finds that most deaths from this disease occur between the ages of 50 and 60 years. The form of cancer which most frequently attacks the stomach is the scirrhus or hard cancer. Out of 180 cases, scirrhus occurred in 130 (or nearly three-fourths of the whole), medullary or encephaloid cancer in 32, colloid in 17, melanotic deposit in 3, and villous cancer in 1. In the treatment of this formidable disease, more good is done by careful attention to the diet than by any medicine. Good milk or strong beef-tea thickened with biscuit-powder, may be given in the same manner as recommended in ulcer; and milk mixed with a little old Jamaica rum will sometimes stay on the stomach when everything else is vomited. If there be pain, opiates must be given, and they may be prescribed either in the ordinary way, or as enemata, the latter having the advantage of not inducing constipation.

Hæmatemesis, or *Vomiting of Blood*, must be looked upon rather as a symptom than a disease. Thus, it may occur by the ulcerative destruction of the walls of a comparatively large blood-vessel, as in gastric ulcer and in cancer; but it generally is of the kind termed capillary. The latter kind of hæmorrhage happens under various circumstances, of which the following are the principal: 1. The bleeding may be idiopathic, or unaccompanied by any structural change. This variety is extremely rare. 2. It may take the place of some habitual hæmorrhage, or, in other words, be vicarious. Thus it frequently takes the place of the menstrual discharge. 3. It is often a consequence of disease or injury of the stomach; for example, it frequently occurs after the ingestion of strongly irritant poisons, or even an immoderate dose of alcohol into the stomach. 4. It may be a consequence of disease in adjacent viscera, occasioning an overloading of the veins of the stomach; thus it is frequently caused by enlargement of the spleen, and occurs in those states of the liver in which there is obstruction of the portal circulation; and under this category we must place the gastric hæmorrhage which not unfrequently occurs in the advanced periods of pregnancy, in consequence of the pressure exerted by the enlarged uterus on the venous circulation of the abdomen. 5. It may result from changes in the composition of the blood, such as occur in scurvy, purpura, and yellow fever. The treatment must be directed against the disease on which the hæmorrhage depends, rather than against the mere symptom; but from whatever cause it arises, if it is proceeding to a dangerous extent, the patient should be kept perfectly quiet in bed, and should swallow small pieces of ice. Hot applications may also be applied to the extremities, with the view of directing the blood to those parts. The medicines most likely to be of service are acetate of lead, gallic acid, dilute sulphuric acid, and oil of turpentine; but they should only be given on medical authority.

Some of the other affections of the stomach are discussed in special articles. See CARDIALGIA, INDIGESTION, SARCINA, &c.

STOMA'PODA (Gr. mouth-footed), an order of malacostracous crustaceans, to which *Squillidæ*, Glass-crabs, &c. belong. All of them are marine. They are most abundant in tropical seas, but some are found in those of temperate parts of the world. They have seven or eight pair of legs, mostly near the mouth. The gills are external, adhering to the appendages beneath the abdomen, which is elongated, and terminates in an extended tail-fin. The rings which bear the eyes and the antennæ are not confounded with the rest of the head, as in the *Decapoda*, but are more distinct. The carapace often leaves the latter rings of the thorax exposed. The heart is very different from that of the *Decapoda*, assuming the form of a long cylindrical vessel, which extends throughout the length of the abdomen.—The S. inhabit deep parts of the sea, many of them living at the bottom, whilst some, as Glass-crabs, are found floating at the surface.

STO'MATA (Gr. mouths) are minute openings in the epidermis of leaves and other green parts of plants exposed to the air, communicating with intercellular spaces. Their existence was first noticed by Grew, who described them in his *Anatomy of Plants* in 1682. They are generally formed by two semilunar cells, which are as lips to the orifice, and are filled with green matter; but sometimes the cells arranged around them are more numerous. They are generally of an elliptical form, but sometimes circular, and sometimes quadrangular. These differences are very characteristic of particular species, genera, or orders of plants. In a moist state of the atmosphere, they are open; but when it becomes dry, they are closed, or nearly so. It appears that they are organs of transpiration, and that their opening and closing according to the moisture or dryness of the atmosphere regulates it in a manner suitable to the requirements of the plant. They do not occur in any part of the plant covered by the soil, nor in submerged leaves, nor on the lower side of floating leaves. Succulent plants have very few of them; so that these plants retain for a long time the moisture which they have imbibed, and are thus adapted for living in a dry atmosphere. S. are generally

most abundant on the under side of leaves; but in leaves which grow vertically, they are often almost equally numerous on both sides. In general, they are irregularly placed; but in grasses and many other endogenous plants with parallel-veined leaves, they are in regular rows; and in some other plants they occur in little groups. The number in a square inch varies from 200 in the mistletoe, to almost 450,000 in the under side of the leaves of *Solanum sanctum*.—S. are not found in mosses, lichens, algæ, and fungi; but they exist in some of the *Hepaticæ*, as in *Marchantia*, in which their structure is more complex than in the higher plants; each of them consisting of a kind of shaft, composed of four or five rings placed one upon the other, every ring made up of four or five cells, and the lowest ring apparently regulating the aperture by the contraction or expansion of the cells which form it.

STONE, a market-town of Stafford, stands 7 miles north-north-west of the town of that name, on the left bank of the Trent. Shoemaking, tanning, malting, and brickmaking, are the chief branches of industry. Near the church are some remains of an Augustinian monastery. Pop. (1851) 3443; (1861) 4509; (1871) 3732; (1881) 5669.

STONE, a weight in use throughout the north-west and central countries of Europe, but varying much in different countries. It is chiefly employed on the continent for weighing wool, hemp, flax, and feathers, the flax-stone containing twice as many pounds as the one used for wool and feathers. In all the principal commercial states of Germany, the stone (of flax) is the $\frac{1}{5}$th of a cwt. (centner = 100 or 112 lbs.), i. e., 20 lbs., in Prussia and the Zollverein, Hamburg, Lübeck, and Bremen; 22 lbs. in Austria, &c.; in Britain, it is the $\frac{1}{8}$th of a cwt., or 14 lbs.; while in Sweden it is equivalent to 32 lbs. In Great Britain, though the stone of 14 lbs. is the only legal imperial weight of the kind, stones of other values are in regular use, as a stone of 24 lbs. for wool, and one of 8 lbs. for butcher-meat.

STONE. See CALCULUS and LITHOTOMY.

STONE is used for a great variety of purposes—for building, paving, millstones, grindstones, hone-stones, ornamental purposes, &c. Besides what is said under special headings (see BUILDING STONE, QUARRY, MILL, GRINDSTONES, HONES, MARBLE, GRANITE, SLATE, &c.), the following general remarks may be added here. The desirable properties in a building-stone are, that it should be compact, insoluble in water, not easily altered by the atmosphere, and not liable to take on a vegetable coating. These qualities depend upon its chemical composition and on its mechanical structure. Building stones may be divided into three classes—siliceous, calcareous, and composite. Siliceous stones (including granite, porphyry, gneiss, greenstone, basalt, sandstone, slate, serpentine, &c., and containing from 45 to 99 per cent. of silica) are, as a general rule, the most durable for building. Their durability is affected by certain of their ingredients, as by the felspar in granite, and salts of iron in sandstone. Calcareous stones (simple limestone, travertin, marble, &c.) are slightly soluble in pure water, and more so in carbonic acid water; they are liable to splinter by water freezing in their pores, are acted on by acid gases (e. g., the sulphurous acid gas produced by the combustion of most kinds of coal), and are somewhat liable to be stained by minute plants. Still, some of them are lasting enough in a country atmosphere. The failure of the magnesian limestone selected for the British Houses of Parliament is a good instance of a stone lasting for centuries in a country church, and yet quite unable to withstand the wasting action of the atmosphere of a great city. Composite stones, in which neither the silica nor the lime greatly predominates, are unimportant.

The most exhaustive account of the building stones of the British Islands is given in the parliamentary Blue Book embodying the Report of the Commissioners appointed to select a stone for the Houses of Parliament, published in 1839. Much scientific information regarding all kinds of stone will be found in the catalogue of the Rock Specimens of the Museum of Practical Geology, London.

STONE, ARTIFICIAL. Artificial stone, properly speaking, would include burned clay wares used for building purposes, as bricks, Terra Cotta (q. v.), &c., as well as the various cements. We shall confine ourselves here to a description of the siliceous artificial stone produced by the cementing properties of soluble alkaline silicates on sand, which has excited a great deal of attention within the last ten or twelve years. So far back as 1825, Professor J. N. von Fuchs of Munich published a paper on various applications of these silicates, and so laid the foundation of a new industry. To M. Kuhlmann of Lille, however, is mainly due the merit of working out the practical application of the soluble silicate of potash or soda to the manufacture of hydraulic lime, cement, and especially to artificial stones. Mr Frederick Ransome of Ipswich has also done great service by his successful exertions in producing an artificial stone from the same substances. The process, as at first practised by Mr Ransome, consisted in mixing the gelatinous silicate of soda with sand and a little powdered glass and clay, in the proportions of sand, 10 parts; glass, 1 part; clay, 1 part; and silicate of soda, 1 part. These ingredients were thoroughly incorporated in a pug-mill, and brought to the consistency of putty. The plastic nature of the substance at this stage allows it to be moulded with ease into an endless variety of forms, even of an elaborately ornamental kind. After leaving the moulds, the objects are dried in close ovens, and then removed to kilns, where they are fired at a gradually increasing temperature, which finally reaches a red heat. In the kiln, the goods are bedded up in dry sand, to prevent any of the twisting or loss of shape which so commonly disfigures large objects in baked clay. When the firing is completed, the material is in the state of a semi-vitrified mass, with the appearance, properties, and composition of a fine sandstone.

A more recent patent of Mr Ransome's consists in producing a hard and durable material altogether without baking, by effecting a double decomposition with the silicate of soda and the chloride of calcium. Such materials as sand, chalk, or other minerals are intimately mixed with a proper quantity of a solution of silicate of soda, this being secured, as before, by the operations of a pug-mill. In this plastic condition, they are moulded into any required form, after which they are saturated with a solution of chloride of calcium. The silica combining with the calcium forms at once an insoluble silicate of lime, which cements into a firm mass all the particles of sand, lime, &c. used in the composition. The chlorine, on the other hand, combines with the soda to form common salt (chloride of sodium), which can be readily removed by washing.

The great advantage of this 'Patent Concrete Stone,' as it is called, is, that it can be manufactured on the spot, wherever it is required. There is reason to believe that it will also be less affected by town atmospheres than many natural building-stones. In point of transverse strength, it is superior to Portland stone, bearing, in fact, twice as

much weight, in the form of a bar, before it breaks. It also considerably excels it in cohesive power.

The objects into which artificial stone is manufactured are very miscellaneous. Among the more prominent applications of it, we may notice grindstones, millstones, fountains, vases, statuary, &c. See *Rep. of American Commissioners to Paris Exhibition*, vol. iii., Washington, 1869; also *Practical Treatise on Soluble Glass, &c.*, by Dr. L. Feuchtwanger, 1870.

STONE-CHAT (*Saxicola rubicola;* see CHAT), one of the most common of the British *Sylviadæ*, a pretty little bird, rather smaller than the redbreast,

Stone-chat (*Saxicola rubicola*).

black on the upper parts and throat in summer; the breast of a dark reddish colour; some white on the sides of the neck, the wings, and the tail. It makes its nest on the ground, or on a low branch. Some stone-chats spend the winter in Britain, but the greater number migrate to more southern regions.

STONECROP. See SEDUM.

STONE-CUTTING AND DRESSING MACHINES. Stone is a substance which in none of its varieties is easily operated on by machinery, owing chiefly to its brittleness, its unequal hardness, and the natural cracks which so frequently impair its solidity. Accordingly, though many ingenious machines have been invented for working stone, it is as yet only in some of the plainer kinds of work that they can be said to have entirely superseded hand operations.

Some stones and slates are soft enough to be cut with ordinary toothed saws much in the same way

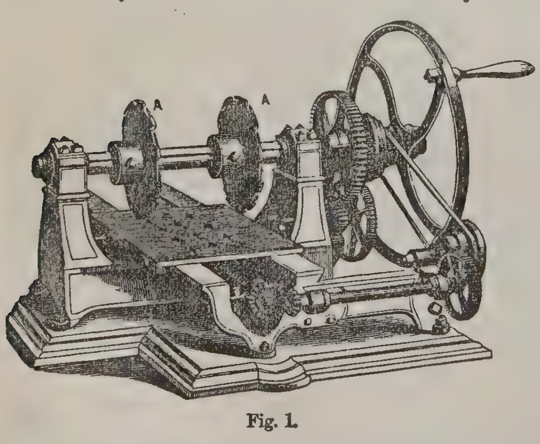


Fig. 1.

as wood is cut. More generally, however, the sand-saw is employed, which we shall presently describe in noticing marble-cutting. For the cutting of common kinds of stone, which are not to receive a fine polish, a machine, which promises to be very efficient, has been recently patented by Mr George Hunter of Maentwrog, Caernarvon, and is now in operation at various large quarries, both of stone and slate. The cutting portion consists (fig. 1) of a circular disc, A, A (two of these are shewn in the figure, but the number varies), round the circumference of which a number of pointed steel tools are fixed into sockets, thus giving it the appearance of a large toothed saw. The following is stated to be the rate per minute at which this machine will cut various well-known stones, supposing them to be in blocks each 2 feet thick: slate, 3 inches; Portland stone, 5 to 6 inches; sandstone, 5 to 6 inches; soft limestone, 3 inches; Arbroath flagstone, 5 to 6 inches; and Caithness flagstone, 5 inches.

It is now more than a century since machinery for sawing and polishing marble was first established at Ashford, near Bakewell, in Derbyshire, that county being still the seat of the principal marble manufacture of England. Marble is cut into slabs by means of a series of thin plates of soft iron used like saws, but having no teeth. The saw-blades are fixed into a rectangular frame, to which a reciprocating horizontal motion is given. The block of marble to be cut rests on a carriage below the frame, and a small rill of mixed sand and water is constantly falling into each of the saw-cuts.

A stone-cutting machine, said to be distinguished by the simplicity and rapidity of its action, was invented a few years ago by a Frenchman, in which the operation of sawing is effected by a thin iron wire running over the stone at the rate of 40 feet per second, but we are not aware how far it has been actually used.

After the marble has been sawn into slabs, it is cut up into narrow pieces, when so required, by means of small circular saws with smooth edges, sand and water being employed as above.

The sawn slabs are next submitted to the grinding process. This, for pieces of moderate size, is usually done upon a large circular cast-iron plate, called a *sanding-bed* or *grinding-bed*, mounted upon an upright spindle, and supplied with sand and water. The workman places the piece of marble with its face downwards upon the grinding-bed, and exerts the proper amount of pressure. The marble is held in its place by means of guide-rods stretched across the plate. Slabs too large to be manipulated in this way are ground with plates of iron operating upon their surface.

The marble, when properly ground, is polished on a polishing bed or table, with an arrangement for securely fixing it while the rubbing is being proceeded with. The polishing rubbers are sometimes blocks of wood faced with felt, and sometimes bunches of hemp compressed between two side-plates. They are attached to a swing-frame with a pendulum-like motion, which draws them backwards and forwards over the surface of the marble. Flour emery is used to charge the rubbers in the first instance, and putty-powder (oxide of tin) for the finishing polish. Instead of emery, sometimes the fine-grained stone known as Water of Ayr stone is used to prepare the marble for the putty-powder.

Cylindrical objects, such as columns or vases, are first formed roughly into shape with a hammer and chisel, and then turned, with a pointed steel tool, upon a lathe, to which a slow motion is given. When thus brought to an accurate form, a rapid motion is given to the lathe and the tool-marks ground away by the use

of coarse, and then fine, and still finer sandstones—the polishing being completed with emery and putty powder while the object is still upon the lathe.

Machinery is also applied to the production of flat objects with curved and moulded outlines. Fig. 2 represents the essential parts of a machine for this purpose. It operates by the use of a rotatory cutter, which is guided in its action by a template formed accurately to the intended shape of the article.

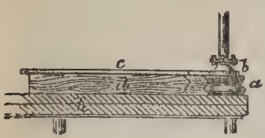


Fig. 2.

The cutter, *a*, is of steel or stone, and is attached to the lower end of a spindle driven by bevelled wheels. There is a flange at *b*, which allows the cutter to penetrate the marble till it reaches the template, *c*, and no further. In the process of cutting, the marble, which we will suppose is to receive the shape shewn at S (fig. 3), but only seen on edge at *d*, in fig. 2, is constantly drawn up against the cutting-tool by two weights, the one pulling the table, *h*, in one direction, the other the carriage on which *h* rests, in a direction at right angles to the former, thus compelling the cutter to follow the outline of the template. The shape of the cutting-tool is, of course, exactly the reverse of the moulding to be formed.

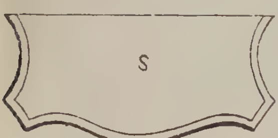


Fig. 3.

In the cutting and polishing of granite, the machinery and processes are so nearly the same as those employed for marble, that it is unnecessary to describe them separately. Suffice it to say, that all objects to which the sawing apparatus cannot be applied, require to be worked to shape with great care by means of steel chisels and iron mallets, which only remove small portions at a time. Owing to the great hardness of the material, any defect in the chiselling greatly increases the labour of polishing. The slow operations of stone-cutting and polishing can now be greatly expedited by the application of the 'sand blast' of Tilghman, introduced in Philadelphia in 1871. See SAND BLAST.

STONE-FLY (*Perla*), a genus of Neuropterous insects, of the tribe or family *Planipennes*. The hind wings are broader than the fore-wings, and folded at the inner edge. The body is elongate, narrow, and flattened; the wings close horizontally on the body; the abdomen is generally terminated by two bristles (*setæ*). The larvæ are aquatic, and much resemble the perfect insect, except in the want of wings. A number of species are common in Britain, and are well known to anglers as an attractive lure for fishes.

STONE-FRUITS, in Popular Language, are those fruits which are botanically designated *drupes*, and in which the rind is fleshy, and the putamen bony. Many of the finest dessert fruits are of this description. Those best known in temperate climates generally belong to the natural order *Rosaceæ*, sub-order *Amygdaleæ*, the order *Drupaceæ* of Lindley, as the peach and nectarine, plum, cherry, apricot, &c. In tropical countries, many stone-fruits occur, belonging to *Chrysobalanaceæ* and other natural orders.

STONEHA'VEN, a seaport town of Scotland, capital of the county of Kincardine, and a station on the railway from Dundee to Aberdeen, is situated on a rocky bay at the mouth of Carron Water. It is divided into an Old and New Town, on different sides of the river, and connected by a bridge. The harbour can admit only small vessels. S. has very considerable haddock and herring fisheries, and some slight manufactures. Pop. 3009. Two miles south, on a projecting rock, stands the famous castle of Dunnottar, once the residence of the Earls Marischal.

STO'NEHENGE (Sax. *Stanhengist*, hanging or uplifted stones), a very remarkable structure, composed of large artificially raised monoliths, situated on Salisbury Plain, two miles from the town of Amesbury, in Wiltshire. Its neighbourhood abounds in sepulchral tumuli, in many of which ancient British remains have been found. The fabric of S., which was comparatively entire in the early part of the present century, has been so much defaced in recent times as to be at first view little more than a confused pile of moss-grown stones; but a minute inspection will still enable one to trace its original form. When entire, it consisted of two concentric circles of upright stones, enclosing two ellipses, the whole surrounded by a double mound and ditch circular in form. Outside the boundary was a single upright stone, and the approach was by an avenue from the north-east, bounded on each side by a mound or ditch. The outer circle consisted of 30 blocks of sandstone, fixed upright at intervals of 3½ feet, and connected at the top by a continuous series of imposts, 16 feet from the ground. The blocks were all squared


Stonehenge.

and rough-hewn, and the horizontal imposts dovetailed to each other, and fitted by mortise-holes in their under sides to knobs in the uprights. About 9 feet within this peristyle was the inner circle, composed of 30 unhewn granite pillars, from 5 to 6 feet in height. The grandest part of S. was the ellipse inside the circle, formed of 10 or 12 blocks of sandstone, from 16 to 22 feet in height, arranged in pairs, each pair separate, and furnished with an impost, so as to form 5 or 6 trilithons. Within these trilithons was the inner ellipse, composed of 19 uprights of granite similar in size to those of the inner circle; and in the cell thus formed was the so-called altar, a large slab of blue marble.

There has been much speculation regarding the origin and purpose of S., which are still involved in much obscurity. A curious legend, first found in the *British Chronicle* of the 10th c., and repeated by Geoffrey of Monmouth and Giraldus Cambrensis, ascribes it to Emrys or Ambrosius, the last British king, who, in the 5th c., aided by the incantations of the magician Merlin, is said to have erected it in memory of 460 Britons, who were murdered by Hengist the Saxon. In modern times, the most prevalent opinion has been that, in common with other similar structures elsewhere, it was a

temple for Druidical worship; but this belief has been somewhat shaken by the discovery of the sepulchral character of many other monuments, which have been also presumed to be Druidical. The circular form has suggested the idea of a connection with the worship of the sun; and S. may possibly have been used for the religious rites of various successive races and creeds; and also as a court of justice or battle-ring for judicial combats. The outer circle is evidently of a much later date than the rest, and seems to belong to a period when iron tools were in use. See STANDING STONES.

STO'NEHOUSE, EAST, a parish of Devonshire, included within the limits of the parliamentary borough of Devonport (q. v.), and forming in effect a portion of Plymouth (q. v.). Among other government establishments, it contains the Royal William Victualling Yard, naval hospital, and marine barracks capable of accommodating 1000 men. Pop. of parish (1851) 11,979; (1861) 14,343; (1881) 15,125.

STONE PERIOD. See BRONZE, AGE OF.

STONE-POCK, an old name for a variety of modified smallpox, in which the vesicles dried up into hard tubercles instead of proceeding onwards to maturation.

STONE, PRESERVATION OF. The mechanical preservation of stone can be effected to a great extent by coating the surface with boiled linseed oil, or with oil-paint; but these methods are not much in favour, as they destroy the crystalline appearance which constitutes the beauty of most natural stones. As promising a better result, many experiments have been tried, especially of late, with certain chemical solutions that are not likely to mar the inherent beauty of a stone. The substances which have been most used are those soluble silicates which we have referred to under ARTIFICIAL STONE. The earlier process of Kuhlmann consisted in coating the surface with a soluble silicate of soda or potash, which is also known by the names of soluble glass, water-glass, and flint liquor. This was applied with a brush, and silification was produced by the silica of the solution entering into combination with the lime of the stone; but this took a considerable time, so that, on an exposed front, it was liable to be washed out before the proper hardening took place. The later process of Ransome consists in cleaning the surface of the stone from extraneous matter, and then applying alternate solutions of the above alkaline silicate and chloride of calcium, which forms an insoluble silicate of lime in the pores of the stone. This plan has been tried with a portion of the new Houses of Parliament, and has been frequently reported as successful. But as the question of preserving this very building has been the subject of public inquiry since the above was tried, namely, in 1861, and the labours of the committee who sat, aided by a chemical sub-committee, did not succeed in discovering any preserving agent which they felt justified in proposing, the efficacy of Ransome's process cannot be held as settled. The chemists engaged in this inquiry select, from a vast number of proposals then made, the following processes, as claiming a careful investigation: 1. Application of silicates of the alkalies, in various states of concentration; 2. Application of silicates, in conjunction with various saline compounds, intended to produce double decomposition; 3. Application of hydrofluoric or hydrosilicic acid, or their saline compounds; 4. Application of phosphoric acid and acid phosphates; 5. Applications of solutions of the alkaline earths, or their bicarbonates, in water.

STONE-WARE. See POTTERY.

STO'NINGTON, a town and port of entry of Connecticut, U. S., at the eastern extremity of Long Island Sound, 63 miles east of New Haven, and at the junction of one of the railway and steamer routes between New York and Boston. It has a fine harbour, with 13,000 tons of shipping, engaged in coasting-trade and fisheries, and numerous manufactories. S. was settled in 1649. Pop. (1880) 7353.

STO'NY POINT, a small rocky promontory on the right bank of the Hudson River, at the entrance of the Highlands, 42 miles north of the city of New York. This and the opposite Verplancks Point were fortified in the war of the Revolution, and were the scene of several contests.

STOOL OF REPENTANCE, the name ordinarily given in Scotland to a low stool conspicuously placed in front of the pulpit in churches, on which persons who had become subject to ecclesiastical discipline for immoral conduct were required to sit during public worship, in profession of their penitence, or on which they stood at the close of the service to be 'rebuked' by the minister. It was also familiarly called the *cutty* stool, a term applied to small stools of similar form, common in houses, but which came to be often employed in conversation and in humorous verses with special reference to that which stood in the church. Transgressions of the seventh commandment being far more frequently the cause of occupying the Stool of Repentance than offences of any other kind, the jokes which abounded on the subject of this piece of church-furniture were neither indicative of a pure morality nor calculated to promote it; and the Stool of Repentance, although used in some places within the present century, has now fallen into complete disuse; whilst the practice of formal public rebuke, as a part of Church-discipline (q. v.), has also generally been laid aside.

STOP, or **REGISTER**, a name given to the different ranges of pipes in an organ. Each stop consists of a series of pipes, of the same quality of tone, extending throughout the whole or a large part of the compass of the instrument, and furnished by a draw-stop or knob, on drawing which out, the air is admitted to the particular stop, so that the keys will play on pipes of that character. Some of the stops do not give the note which corresponds in pitch with the key struck, but a note an octave or two octaves lower, or one of the harmonics higher in pitch. Compound or mixture stops consist of more than one row of pipes to each key, corresponding to the different harmonics of the ground tone. The stops of different organs vary much in number and kind; a very large number are to be found in many of the organs in Germany and Italy. See ORGAN.

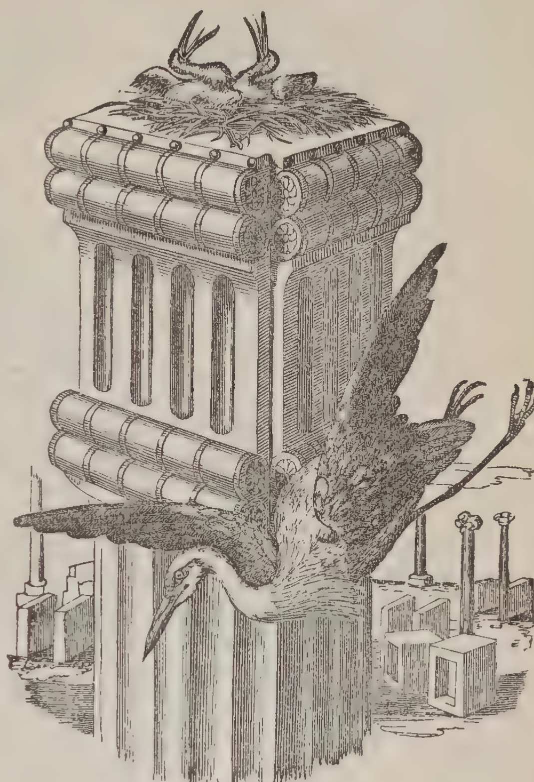
STO'PPAGE IN TRA'NSITU is a valuable right or privilege of a vendor of goods to resume possession, after he has parted with them under a contract of sale, and before the goods have reached the vendee. It occurs when goods are consigned entirely or partly on credit from one person to another, and the consignee becomes bankrupt before the goods arrive. In this event, the consigner has a right to direct the captain of the ship or other carrier to deliver the goods to himself or his agent instead of the consignee, who has thus become unable to pay for them. This right was first allowed as equitable by the Court of Chancery, and the courts of common law followed the example. There are certain circumstances, however, in which the right to stop *in transitû* may be defeated, as where the consignee of the goods indorses the bill of lading to a *bonâ fide* indorsee. When the vendee has appointed the carrier who is to receive the goods, their delivery to the carrier is treated for many purposes as

delivery to the vendee himself; yet it is not too late for the vendor to stop the goods so long as they have not come into the actual possession of the vendee. The right to stop *in transitû* is not allowed to a vendor unless in case of the bankruptcy of the vendee or his stoppage of payment.—The same rule extends to Scotland.

STOPPAGES, Military and Naval, are certain deductions made from the pay of officers and men, in consideration of supplies made to them, or in aid of certain institutions. These stoppages were formerly more numerous than now. Thus, every officer and man had to pay towards Chelsea and Greenwich hospitals, and a soldier had to pay for his kit by a stoppage from the bounty. These stoppages have been remitted. Those now remaining are, under ordinary circumstances, limited in the navy to payment for slops (i. e., clothing) issued to men, or for wilful damage: in the army, to payment for the daily Ration (q. v.); for forage, 8½*d.* each ration by cavalry officers, and 6*d.* for artillery officers (though their horses eat the same); for messing on board ship; for diet in hospital; for cost while in prison; for washing sheets; and for damages to barracks.

STO'RAX, a fragrant resinous substance, the *Styrax* of the ancients, obtained from the Storax-tree (*Styrax officinalis*), a native of the countries around the Mediterranean Sea, and belonging to the natural order *Styracaceæ*, an order of exogenous plants, containing more than 100 known species. The species of this order are found in the tropical and subtropical parts of Asia, extending also into Europe and Africa, and the warm parts of America. *Styrax officinalis*, which produces S., is a tree of 15—20 feet high, a native of the Levant. S. is obtained by wounding the bark, when it exudes and hardens in the air. It appears in the form of reddish-yellow tears about the size of a pea, opaque, soft, and adhesive; or in dry brittle masses, wrapped in the leaves of a kind of reed, when it is called *S. calamita*. S. has a fragrant odour and an aromatic taste, and is stimulating and expectorant. It was formerly much more in use in medicine than now. Benzoin (q. v.) is the produce of a species of *Styrax*. The *Liquid S.* of the shops is doubtfully regarded either as produced by *Styrax officinale*, or by a species of *Liquidambar* (q. v.). It seems probable that there are two kinds.

STÓRK (*Ciconia*), a genus of birds of the same family (*Ardeidæ*) with herons and bitterns; large birds; with long legs, four-toed, the three front toes webbed to the first joint; the tail short; the wings large; the bill longer than the head, straight, strong, pointed, and without any groove, the nostrils pierced longitudinally in the horny substance; the eyes surrounded by naked skin. The species are not numerous, but they are of very wide geographic distribution. The Common S., or White S. (*C. alba*), is a native of the greater part of the Old World, a migratory bird, its range extending even to the northern parts of Scandinavia. It is common in most parts of Europe. It is about three feet and a half in length. The head, neck, and whole body are pure white; the wings partly black; the bill and legs red. The neck is long, and generally carried in an arched form; the feathers of the breast are long and pendulous, and the bird often has its bill half hidden among them. The S. frequents marshy places, feeding on eels and other fishes, batrachians, reptiles, young birds, and small mammals. It makes a rude nest of sticks, reeds, &c., on the tops of tall trees, or of ruins, spires, or houses. In many parts



Stork's Nest at Persepolis.

of Europe, especially in Holland, it is a very common practice to place boxes for storks, and it is considered a fortunate thing for a household that the box on the roof is occupied. Storks are protected by law in some countries, on account of their good services not only in destroying reptiles and other troublesome animals, but in the removal of offal from the streets of towns, in which they stalk about with perfect confidence, even in the midst of throngs of people. They have been celebrated from ancient times for the affection which they display towards their young; and have also had the reputation—not so well founded—of shewing great regard to their aged parents. Before they take their departure from their summer haunts, they congregate in large flocks, which make a great noise by the clattering of their mandibles, and are popularly regarded as holding consultation. The S. has no voice. Its flight is powerful, and very high in the air. It is a very rare bird in Britain, and was so even when the fens of England were undrained. The flesh of the S. is rank, and not fit for food.—Another species, the Black S. (*C. nigra*), rather smaller, the plumage of the upper parts glossy black, the under parts white, is also common in many parts of Europe, Asia, and Africa.—The American S. (*C. maquari*) is very similar to the Common Stork.

STORMS are violent commotions of the atmosphere, occurring in all climates, particularly

the tropics, and differing from other atmospheric disturbances in the extent over which they spread themselves, their destructive power, and the sudden changes which take place in the direction of the wind. There is, perhaps, no question in science in which there has been so large an admixture of speculation with fact, as in the attempts made to reduce the phenomena attendant on storms under general laws; the reason being, that meteorological observatories were too few in number, and too wide apart, to enable any one to give the barometer pressure, the general course of the winds, and the rainfall, without drawing largely on conjecture. Now, however, owing to the growing popularity of meteorology, and the countenance happily given to it by most civilised nations, sufficient data have been obtained for a fuller and more satisfactory statement of the facts.

We subjoin two charts of Europe, shewing, from actual observations made at upwards of 100 localities scattered over that continent, the barometric pressure, and direction and force of the wind, at 8 A. M. of the 1st and 2d of November 1863, during part of the course of two storms which

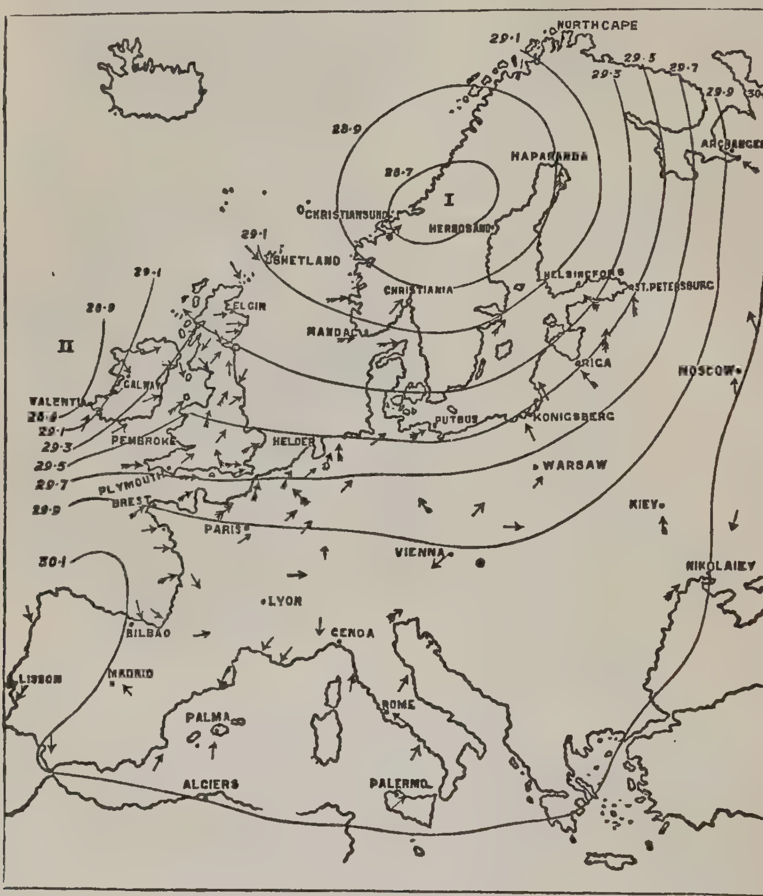


Fig. 1.—At 8 A.M., November 1, 1863.

passed over Europe at that time. The isobarometric lines, or lines shewing where, at the above hours, the height of the barometer was the same, are given for every two-tenths in the difference of the pressure. Hence, where these lines approach near each other, or crowd together, the difference of pressure, or the atmospheric disturbance, was the greatest; and the least where they are most apart—a distinction of the utmost importance in determining where the storm may be expected to rage in greatest fury. The arrows shew the direction of the wind, being represented flying with it. The force of the wind is shewn (1) by plain arrows, ⟶, which represent light and moderate winds; (2) by arrows feathered on one side only, ⟶, which represent high winds; (3) by arrows feathered on both sides, ⟶, which represent strong gales, storms, or hurricanes.

The mean atmospheric pressure, at the level of the sea, may be stated to be 29·9 inches. When, therefore, the barometer falls below 29·9, the equilibrium of the atmosphere is more or less destroyed according to the amount of the fall, and it is within this *area of low barometer* that a storm may be expected to occur. Hence, while we trace these low pressures, as they advance over the earth's surface from day to day, we trace at the same time the progress of the storms.

Form and Extent of Storm Areas.—The circular isobarometric lines on the charts represent very accurately the general shape storms assume. The area of almost every storm is either circular or

slightly elliptical, and when elliptical, the major axis of the ellipse seldom exceeds twice the length of the minor axis. Rarely in Europe, but in America less rarely, the form of storms is much more elongated. The outline is occasionally very irregular, but in all such cases the storm will be found to have parted into two or more distinct storms, which remain separate for some time and then re-unite. This circular form of storms, which an examination of some hundreds, especially in

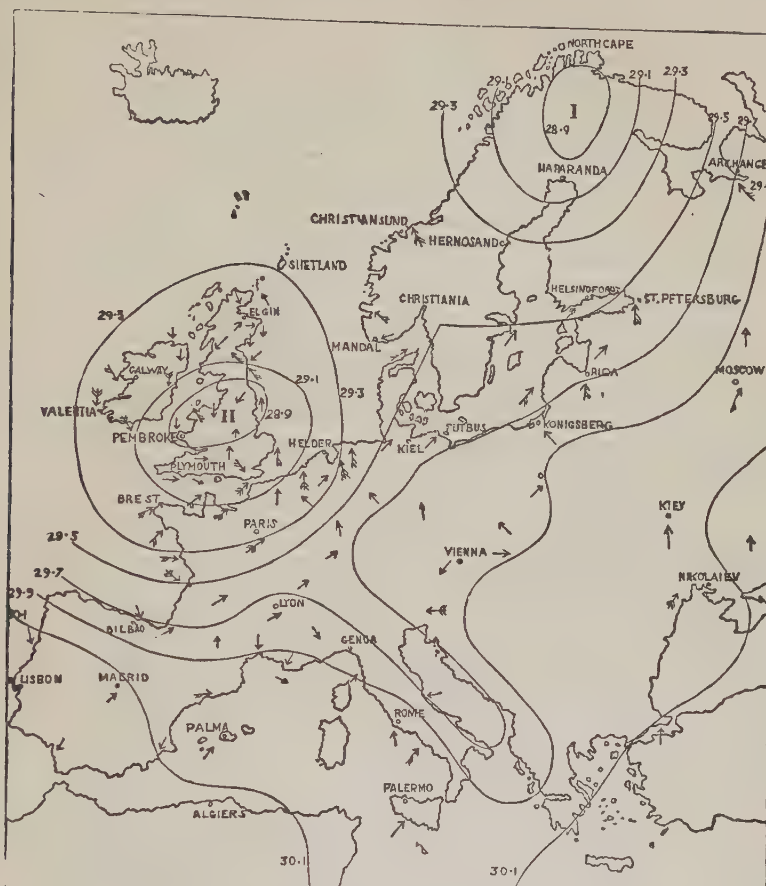


Fig. 2.—At 8 A.M., November 2, 1863.

Europe, has shewn to be their general characteristic, is a most important feature, whether as determining the practical rules for the guidance of sailors in storms, or for the forecasting of storms at particular seaports, in respect of the direction from which they may be expected to come, and the veerings of the winds during their continuance. The extent over which storms spread themselves is very variable, being seldom less than 600 miles in diameter, but often two or three times that amount, or even more. Almost the whole of Europe is sometimes overspread by a single storm at one time. The area of storms is by no means constant from day to day, but varies in size, sometimes expanding and sometimes contracting. And it is worthy of remark, that when a storm contracts its area, the central depression gives signs of filling up, and the storm of dying out. On the other hand, when it increases in extent, the central depression becomes deeper, the storm increases in violence, and occasionally is broken up into two, or even three, depressions, which become separate storms, with the wind circling round each.

Direction in which Storms advance.—It may be premised that by the direction of a storm is meant, not the direction of the wind, but the path followed by the centre of disturbance. The direction in which the progressive motion of storms takes place differs in different parts of the world—being determined by the prevailing winds. See WINDS. Thus, about half the storms of the northern Atlantic states travel from the south-west toward the north-east, and 19 out of every 20, at least, travel toward some point in the quadrant from the north-east to the south-east. Observation shews that the longer axis of the storm is almost always coincident with the direction in which the storm appears to be moving at the time. Storms do not always proceed in the same uniform direction from day to day, and though the change which occurs in the direction of their progressive motion is generally small, yet occasionally it is very great. Thus, of the many interesting features peculiar to the storm which passed over Europe in the beginning of December 1863, none were more remarkable than the sudden changes of its progressive motion. It was first

observed on the west of Ireland, from which it advanced east to Liverpool, then turned south through Worcester and Oxford to Cherbourg in France; it thence retreated north through Oxford to Shields, from which it proceeded east to Copenhagen. By the time it arrived at Copenhagen its extent was only a fourth of what it had been the previous day, and the central depression half an inch less. Twelve hours later, the atmospheric equilibrium was restored, the storm having died out on reaching the Baltic Sea. The storms of the Mediterranean follow a different course. Many of them proceed om the north to the south, influenced probably by the heated air rising from the Sahara; a considerable number proceed from the east, and pass to the westward over Greece and Italy to the Alps; while very few are observed to travel in an easterly direction. By far the greater number of the storms of North America take their rise in the vast plain which lies immediately to the east of the Rocky Mountains, and thence advance in an eastern direction over the United States; some of them, crossing the Atlantic, burst on the western shores of Europe. But the relation of the American to the European storms is not yet established, nor will be till observation has collected more facts. If once the connection be established, and the two continents united by the telegraph, the system of forecasting storms to European ports will become much more certain and complete than it is at present. The storms of the West Indies generally take their rise from near the region of calms, and tracing out a parabolic course, proceed first towards the north-west, and then turn to the north-east about 30 N. lat., many of them traversing the east coasts of North America as far as Nova Scotia. South of the equator they follow an opposite course. Thus, in the South Atlantic and Indian Ocean, they first proceed toward the south-west, and then gradually curve round to the south-east. The hurricanes of Hindustan usually pursue a parabolic path, first traversing the eastern coast towards Calcutta, and then turning to the north-west up the valley of the Ganges. The typhoons of the Chinese Seas resemble, in the course they take, the hurricanes of the West Indies. Observations are wanting from other parts of the world to determine the course of storms.

Everywhere, the course tracked out by storms is determined by the general system of winds which prevail, modified by the unequal distribution of land and water on the surface of the globe. Facts seem at present to point to this general conclusion, viz., *Storms follow the course of the atmospheric current in which the condensation of the vapour into the rain which accompanies them takes place.*

Rate at which Storms travel.—If the position of the centre of Storm I. on the 2d November be compared with its position on the 1st on the charts, it will be found to have travelled 420 miles in 24 hours, or at the rate of $17\frac{1}{2}$ miles an hour. Similarly Storm II. will be found to have travelled in the same time 400 miles, or at the rate of $16\frac{2}{3}$ miles an hour. This is about the average rate of the progressive movement of European storms. Sometimes, however, it falls as low as 15 miles an hour, and sometimes increases to 30 miles an hour. Within the tropics the onward motion of storms sometimes rises to 40 miles an hour.

Relations of Temperature, Rain, and Cloud to Storms.—The temperature increases a few degrees at places toward which and over which the front part of the storm is advancing, and falls at those places over which the front part of the storm has already passed. In other words, the temperature rises as the barometer falls, and falls as the barometer rises. When the barometer has been falling for some time, clouds begin to overspread the sky, and rain to fall at intervals; and as the central depression approaches, the rain becomes more general, heavy, and continuous. After the centre of the storm has passed, or when the barometer has begun to rise, the rain becomes less heavy, falling more in showers than continuously; the clouds break up, and fine weather ushered in with cold breezes ultimately prevails. It should be here remarked, that if the temperature begins to rise soon and markedly after the storm has passed, a second storm may be expected shortly. The rainfall is generally proportioned to the suddenness and extent of the barometric depression at the place where it falls.

Observations of the Wind.—First as to the direction of the wind. If the winds in Storm II. on the 2d November be attentively examined, they will be observed whirling round the area of low barometer in a circular manner, and in a direction contrary to the motion of the hands of a watch, with—and be this particularly noted—a constant tendency to turn inwards towards the centre of lowest barometer The wind in storms neither blows round the centre of lowest pressure in circles, nor does it blow directly towards that centre, but takes a direction nearly intermediate, approaching, however, nearer to the direction and course of the circular curves than of the radii to the centre. The greater the force of the wind is at any place, it will be observed to approach the more nearly the direction here indicated. And where the direction of the wind differs to any material degree from this general law, it is light, and consequently more under local influences, which turn it from its course. Thus, the centre of the storm being near Liverpool, the direction of the wind is south-west at Paris, south at Yarmouth, north-east at Silloth, north at Dublin, and north-west at Cork—instead of south at Paris, south-east at Yarmouth, north at Silloth, north-west at Dublin, and west at Cork, if it had blown directly to the area of lowest pressure; and west at Paris, south-west at Yarmouth, east at Silloth, north-east at Dublin, and north at Cork, if it had circulated in the direction of the isobarometric curves. Hence in this storm the winds circulate round the centre of least pressure, or, to speak more accurately, the whole atmospheric system flows in upon the centre in a spiral course. This rotatory peculiarity is common to all storms in the northern hemisphere that have yet been examined. In the southern hemisphere, a rotatory motion is also observed round the centre of storms, but it takes place in a contrary direction, or in the direction of the motion of the hands of a watch, instead of contrary to that direction, as obtains north of the equator.

To William C. Redfield we are indebted for the determination of the fact of the gyratory motion of storms, and to James P. Espy for the proof that the principal motive force acts vertically. We find by referring to Storm II. on the 2d November, that the pressure over England being much less than in surrounding countries, if the earth had been at rest, air-currents would have flowed from all directions in straight lines to England, to fill up the deficiency. The earth, however, is not at rest, but revolves from west to east; and as the velocity of rotation diminishes as the latitude increases, it is evident that the current which set out, say from Lyon to the north, would, on account of its greater initial velocity when it arrived at Paris, blow no longer directly to the north, but to a point a little to the east of north; in other words, it would no longer be a south, but a south-west wind. Again, since the

current from the north of Scotland had a less velocity than those parts of the earth's surface on which it advanced, it lagged behind, and consequently, by the time it arrived at Silloth in the north of England, had changed from a north to a north-east wind. Similarly the north-west current changed to a north, the south-west to a west, &c. The west and east currents, since they continued in the same latitude, would have blown in the same direction, if they had not been disturbed by contiguous currents. Hence in a storm the whole system of winds rotates round the centre. As a further confirmation of the truth of this theory, it is observed that when a high barometric pressure covers a limited space, the wind is always observed gently *whirling out of this area of high barometer*, but in exactly opposite directions in both hemispheres from those assumed when it blows round and in upon an area of low pressure. It follows in the northern hemisphere that as storms advance, the general veering of the wind at places lying north of the path of their centre is from north-east by north to west; and at places south of their centre, from north-east by east and south to north-west, and conversely in the southern hemisphere.

Next, as to the force of the wind: The rule is simple, and without exception—viz., the wind blows from a high to a low barometer, and with a force proportioned to the difference of the barometric pressures. Hence, where the isobarometric lines crowd together, the violence of the storm is most felt, and where they are far asunder, the winds are moderate and light. We thus see the importance of observations from a distance in forecasting the weather. To take an illustration: the importance of observations from Norway and Sweden to all seaports on the east coast of Great Britain cannot be overestimated. For if the pressure be high in Norway and low in Great Britain, violent easterly gales will sweep down on North Britain, and unless foreseen and provided against, strew the coast with wrecks; whereas, if the pressures be nearly equal, little danger need be apprehended, even though the barometer be low in Britain. As the wind nears the centre of the storm it gradually abates, till on reaching the centre a lull or calm follows. Calms and light winds also prevail along the ridge of highest barometer, or the region where the pressure is greatest, and on receding from which the pressure diminishes on each side. It may not inaptly be compared to the watershed in physical geography, since from it the wind flows away towards the places where the pressure is less.

We have stated that the progressive motion of storms varies from 15 to 40 miles per hour, which measures the time taken in passing from one place to another, but it gives no indication of the violence of the storm. This is determined by the rotatory velocity of the wind round the centre of the storm, which in Europe and America frequently amounts to 60 or 70 miles an hour continuously for some time. At Liverpool, on the 3d of December 1863, it blew in intermittent gusts with a speed of 93 miles an hour—a velocity frequently surpassed by storms within the tropics.

Of the different theories hitherto proposed, we need only refer to the rotatory and the centripetal theories. The rotatory, or, as it is commonly called, the cyclonic theory, was first proposed by Piddington, and has since been elaborated by Redfield, Reid, Dové, and others. By this theory storms are considered as revolving round an axis either upright or inclined to the horizon, while at the same time the body of the storm has a progressive motion over the surface of the globe; the barometric depression, as caused by the centrifugal force, driving the air from the centre to the circumference of the storm. Dové holds that cyclones are formed when two atmospheric currents, the equatorial and the polar, flow side by side, they being, as it were, the eddies formed at the line of junction. Observations from the numerous observatories recently established in Europe and America in no case exhibit a true cyclonic movement of the winds round the centre of the storm, but invariably show, along with the rotatory motion, a constant tendency to blow in upon the centre of the lowest pressure. Hence it is clear that the barometric depression is not caused by the centrifugal force of the storm. All the facts of the rotation of the wind are explained when it is considered as caused by air-currents flowing towards an area of low barometer along the globular surface of the earth rotating eastwards.

The rotatory character of storms was denied by Espy, who maintained that the wind blows from every quarter towards the centre of the storm, and that the central depression is caused by the development of heat, which occurs whenever the vapour of the atmosphere is condensed into cloud or rain; the heat thus developed rarefying the surrounding air and causing an upward current.

The following generalisations have been reached: (1) The area of a violent storm in America is either circular, elongated, or elliptical, is very irregular, and is from 1000 to 3000 miles in diameter. (2) Violent storms sometimes remain stationary for 4 or 5 days, but generally have a progressive movement along the surface of the earth from zero to 44 miles per hour, and within the limits of prevailing westerly winds advance from west to east. (3) The motion of rotation is much more rapid nearer the centre than in the outer whirls, but is succeeded by a lull or calm for a short time, to be followed by a recommencement with additional fury. (4) Skilful seamen, who understand the law of storms and their general course, can foresee their approach, and avail themselves of the outer winds they bring along to waft them away from the track; but inexperienced navigators are often carried across in them as in a whirlpool. (5) Great storms of rain and snow are accompanied by a depression of the barometer near the centre, and a rise near the margin. (6) For several hundred miles on each side of a storm the wind inclines towards the area of least pressure, or from the area of high barometer to the area of low barometer, and in the northern hemisphere circulates around the centre in a direction contrary to the hands of a watch. (7) On the north side of a great storm the prevalent winds are from the north-east, while on the south side they are from the south-west. (8) In the United States, on the north-east side of a storm, at a distance of over 500 miles from the area of rain and snow, the thermometer sometimes rises even 20° above the mean height.

The United States Signal Service, organised in 1870, now embraces stations from Portland to San Francisco, and from Canada to Key West. Three times daily synchronous observations are taken, reports transmitted in full by telegraph to Washington, and the results rapidly distributed to the different cities to be published. These reports are tabulated and examined by Professor Abbé, who deduces therefrom the 'probabilities,' which are also telegraphed to the press all over the country; maps are stamped exhibiting the state of the barometer, thermometer, the clouds, rain, &c., and distributed at commercial points; for a specimen, see *Harper's Magazine* for August, 1871, p. 416. See *The Atlantic Monthly*, March, 1870; *Scribner's Monthly*, Feb. 1871; Fitzroy's *Weather Book;* Loomis's *Treatise on Meteorology*, New York, 1868; and Buchan's *Handy Book of Meteorology*, Edinburgh, 1868.

STORTHING (from *stor*, great, and *thing*, court), the Legislative Assembly of Norway (q. v.). Its members are elected by certain deputies, who, in

their turn, are chosen by a constituency comprising every native Norwegian of 25 years of age, who is a burgess of any town, and possesses property or the liferent of land to the value of £30 sterling, the qualification for being elected being the same. When the storthing is in session, every member is paid an allowance equivalent to about 6*s.* 6*d.* sterling per day. When elected, the storthing meets of its own authority without any writ from the king, and divides itself into two chambers, the *Lagthing* and the *Odelsthing*, the former composed of one-fourth, the latter of the remaining three-fourths of the members.

STORY, Joseph, an American jurist and judge, was born at Marblehead, Massachusetts, September 18, 1779, was educated at Harvard College, and though admitted to the bar in 1801, gave his attention chiefly to general literature and poetry. Having published a volume in 1804, *The Power of Solitude*, and other poems, which met with no success, he bade farewell to the muses, and devoted himself to law and politics. Elected to the state legislature in 1805, he became a leader of the republican, or, as it was afterwards called, the democratic party, and defended the measures of Jefferson. In 1808, he was elected to congress, where he gave a moderate support to the war measures of Mr Madison, who, however, in 1811, appointed him associate justice of the Supreme Court of the United States, a place he filled with great credit for 34 years. In 1820, as a member of the Massachusetts constitutional convention, he advocated a property basis for the senate. In 1829, he became law professor at Harvard. His later politics were of the Federalist school of Washington and Hamilton, and these tincture his *Commentary on the Constitution of the United States.* His other writings are a work entitled *The Conflict of Laws*, and various legal treatises, which have passed through many editions. His constitutional commentaries are considered high authorities, and his legal writings and decisions are among those oftenest quoted in the higher courts of law. He died at Cambridge, September 10, 1845. His Life, by his son, William W. Story, educated a lawyer, but better known as a sculptor, was published in 1851 (2 vols. 8vo, Boston), and in 1854 appeared a collection of his *Miscellaneous Writings.*

STOTHARD, Thomas, R.A., an eminent designer and painter, was the son of a London publican, who kept the *Black Horse* in Long Acre, and was born there in 1755. He received a respectable education in different boarding-schools, and on his father's death, having shewn a predilection for the use of the pencil, was bound apprentice to a pattern-drawer in the city, but was released from his engagement before the term of expiry, and betook himself to more artistic work. His first notable effort was a series of designs for the *Town and Country Magazine*, which was followed by his imaginative compositions for Bell's *British Poets*, and the *Novelist's Magazine.* The popularity of these was so great, that for many years his services were constantly in request by the leading publishers in London. His earliest pictures exhibited at the Royal Academy were 'The Holy Family,' and 'Ajax defending the Body of Patroclus.' In 1791 he was chosen an associate, in 1794 a member, and in 1813 librarian of the academy. He died 27th April 1834. S. was really an admirable and facile illustrator. Not less than 3000 of his designs are known; but his paintings, although gracefully enough 'composed' and finely coloured, are destitute of the originality that comes from a study of nature, and painfully resemble enlarged 'illustrations' for books. Perhaps the best known and the most agreeable of the set is his 'Canterbury Pilgrims,' engraved in 1817, others are the 'Flitch of Bacon,' the 'Fête Champêtre,' and the paintings executed for the staircase at Burleigh, the seat of the Marquis of Exeter. See Mrs Bray's *Life of Thomas Stothard, R.A., with numerous Illustrations from his Works* (1851).—His son, Charles Alfred Stothard (born 1786, died 1821), acquired a great reputation as an antiquarian draughtsman.

STOU'RBRIDGE, a market-town in the county of Worcester, and 20 miles north-north-east of the town of that name, on the left bank of the Stour. It contains iron-works and glass, earthenware, and fire-brick factories. 'Stourbridge clay,' upon which the action of fire has less effect than upon most varieties of clay, is an article of export. Glass-house pots, crucibles, &c., are made of it. Pop. (1861) 8773; (1871) 9376; (1881) 9756.

STOU'THRIEFF, in the law of Scotland, means robbery committed in a dwelling-house.

STOVE, a fireplace in which the fire is generally quite shut in. The term is also applied to a room or closet heated for the purpose of drying and other operations, and to hothouses, in which the artificial heat is constantly maintained at a high temperature. Stoves for domestic purposes will be noticed under the head of Warming and Ventilation. Particular kinds of hothouse stoves are already noticed in the articles Bark-stove and Dry Stove. Stoves are also used for *forcing* fruits, so as to procure them in winter or spring. In the management of stoves, the general rule is that the temperature must never be allowed to fall below 60° F. The free access of air is, of course, desirable, but the windows are not opened unless the temperature reaches 70° F., and care must be taken that cold blasts do not enter, which are often very injurious.

STOW, or STOKE (A.-S., *stoc*, a stockaded place), a component element of many names of places, as Bristow or Bristol, Stockholm.

STOW, John, one of the earliest and most diligent collectors of English antiquities, was born in London in the year 1525. He was brought up to his father's trade of a tailor in Cornhill, but ultimately abandoned it for antiquarian pursuits. Writing in 1575, he says: 'It is now ten years since I, seeing the confused order of our late English chronicles, and the ignorant handling of ancient affairs, leaving mine own peculiar gains, consecrated myself to the search of our famous antiquities.' A patriotic sacrifice, which ought to have insured to the devoted antiquary from his king and country an old age of ease and honour, but which only brought him to want and beggary! In his 79th year, S. obtained letters patent from James I. authorising him to become a mendicant, or, as it is expressed in the state document, 'to collect amongst our loving subjects their voluntary contributions and kind gratuities.' He died April 5, 1605, and was buried in the parish church of St Andrew Undershaft, in Aldgate Ward, where his monument of terra-cotta, erected at the expense of his widow, may still be seen. The principal works of S. are his *Summary of English Chronicles*, first published in 1561, and subsequently reprinted every two or three years, with a continuation to the date of each new publication; *Annals of England*, 1580, and reprinted in 1592, to which year the annals are brought down; and *A Survey of London*, the most important of his writings, published in 1598. Besides these original works, S. assisted in the continuation of Holinshed's Chronicle, Speght's edition of Chaucer, Leland's *Collectanea*, &c. He had collected or transcribed a vast number of MSS., and much valuable information which might otherwise have

perished; and in the use of his stores he was liberal to others, while as an original historian he was faithful and impartial.

STOWE, Harriet Elizabeth Beecher, American authoress, daughter of the Rev. Dr Lyman Beecher, and wife of Rev. Professor Calvin Ellis Stowe, was born at Litchfield, Connecticut, June 14, 1812. At the age of 15, she was engaged with her elder sister, Catherine, as teacher in a girls' school in Hartford. She was married to Professor Stowe in 1836, and became a frequent contributor to periodicals, published some stories in a volume entitled *The May-flower*, and other spirited juvenile stories for the Sunday-school libraries. The ability of Mrs S. as a delineator of character, and especially of New England character, was known to many; but her full power was scarcely suspected, until, in 1851, she commenced in *The National Era*, an anti-slavery paper at Washington, a serial tale, entitled *Uncle Tom's Cabin.* When completed in 1852, it was published at Boston, and its popularity was so immense, that it soon sold in four stereotype editions to the extent of 400,000 copies. The English reprints are estimated to have circulated 500,000, and it was rapidly translated into all European and some Asiatic languages, and was extensively dramatised and illustrated. In 1853, she published a *Key to Uncle Tom's Cabin*, and made a visit to Europe, where she was received with distinguished consideration. The events and impressions of this triumphant tour are recorded in her *Sunny Memories of Foreign Lands* (2 vols. Bost. 1854). In 1856, she published *Dred, a Tale of the Dismal Swamp*, another anti-slavery story, which had a wide circulation. This was followed in 1859 by *The Minister's Wooing*, a story of New England life in the 18th c.; and in 1862 by *Agnes of Sorrento*, and *The Pearl of Orr's Island*, a New England tale. In 1868 appeared *Men of Our Times*; in 1869, *Oldtown Folks*, a picture of New England thought and feeling in the last century; and in 1869, *The True Story of Lord Byron's Life*, in the *Atlantic Monthly* and *Macmillan's Magazine*, which was severely criticised. Mrs. S. replied to her critics in *Lady Byron Vindicated*, Dec. 1869.

STOWELL, William Scott, Lord, the eldest brother of Lord Eldon (q. v.), was born at Heworth, Durham, October 17, 1745. He was educated at Newcastle; went to Oxford in 1761, remained there after taking his master's degree (1767), became a college tutor, was chosen Camden Reader of Ancient History (1774), and distinguished himself in that capacity. In 1779, he took the degree of D.C.L., removed to London, was called to the bar (1780), and admitted to the Faculty of Advocates at Doctors' Commons. Dr Johnson, whom he had accompanied from Newcastle to Edinburgh, while on his tour to the Hebrides, introduced him to the Literary Club, and he became well known in the most intellectual society of London. As an advocate, he at once obtained a large practice, and his promotion was rapid. In 1788, he was appointed judge in the Consistory Court, knighted, and nominated a privy councillor. In 1798, he became judge of the Court of Admiralty, the highest dignity to which he could attain in his own branch of the profession. Both as an ecclesiastical and admiralty judge he won high distinction. He wrote no systematic treatise or text-book, but his judgments were admirably reported, and supply the best evidence of his extensive legal learning, his sagacity, and his great literary ability. He is the highest English authority on ecclesiastical law and the law of nations, and his judgments—those, especially, relating to the rights of belligerents and neutrals—have been described as the most valuable contribution made by an English judge to general jurisprudence since the time of Lord Mansfield. As a politician, Sir William Scott was not remarkable. He represented Oxford in the House of Commons for 20 years, but he took no part in the business of parliament, although, like his brother, he was a zealous supporter of the Conservative party and the established church. At the coronation of George IV. he was raised to the peerage under the title of Baron Stowell of Stowell Park. In 1828 he retired from the bench, and in 1836 he died. Lord S. was twice married, but only one child, Lady Sidmouth, survived him.

STOW'MARKET, a small market-town of Suffolk, on the Gipping, 12 miles north-west of Ipswich. Iron, leather, paper, and gun-cotton are manufactured. The Gipping is navigable to S. Pop. (1861) 3531; (1871) 4097; (1881) 4052.

STRABA'NE, a market-town of the county of Tyrone, Ireland, on the river Mourne, 130 miles north-north-west from Dublin, with which it communicates by railway. It communicates with Londonderry, and thus with the sea, by canal and river. The chief industry is connected with the linen trade, and there is also a valuable fishery. The population, in 1861, was 4146, of whom 2513 were Roman Catholics, 838 Protestants of the Established Church, 713 Presbyterians, and the rest dissenters of other denominations; in 1881, 4196.

STRABI'SMUS. See Squinting.

STRA'BO, an ancient geographer, born at Amasea in Pontus, about the middle of the 1st c. B.C. By the mother's side he was of Greek descent, and also closely connected with the Mithridatidæ; of his father or his father's family nothing is known. How the name Strabo ('squint-eyed') must have originated, is obvious, but whether any of the family were so called before him is uncertain. S. was well educated under the grammarians, Tyrannio of Amisus in Pontus, and Aristodemus of Nysa in Caria, and the philosopher Xenarchus of Seleucia in Cilicia. He does not appear to have followed any professional calling, but to have spent his life in travel and study, from which it may safely be inferred that he was possessed of wealth, or at least of considerable means. He died some time after 21 A.D., but how long, we have no evidence to shew. S.'s *Geography* is a work of great value in those parts especially which record the results of his own extensive observation. 'Westwards,' he says in a passage in the 2d Book, 'I have travelled from Armenia to the parts of Tyrrhenia adjacent to Sardinia towards the south, from the Euxine to the borders of Ethiopia. And perhaps there is not one among those who have written geographies who has visited more places than I have between these limits.' Yet it must not be supposed that he describes with equal accuracy or fulness all the countries of whose geography he treats. Some he seems to have visited hurriedly, or in passing elsewhither; others he knows like a native. For example, his accounts of Greece, particularly the Peloponnesus, are meagre in the extreme, and of many of the obscurer regions he writes chiefly from hearsay. He makes copious use of his predecessors, Eratosthenes, Artemidorus, Polybius, Posidonius, Aristotle, Theopompus, Thucydides, Aristobulus, and many other writers now lost to us, but he strangely depreciates the authority of Herodotus, and quotes few Roman writers except Fabius Pictor and Julius Cæsar. The *Geography* comprises 17 books, of which the first two are introductory, the next eight are devoted to Europe, the six following to Asia, and the last to Africa. The style is pure and simple. The *editio princeps* of S. appeared at Venice in 1516.

the latest and best is that by Gustaf Kramer (Ber. 1844, *et seq.*).

STRADELLA, Alessandro, a Neapolitan musical composer of the 17th c., of much celebrity, both in respect of his influence on the music of that age, and of the tragical history of his life and death. His works, which consist of numerous airs, duets, cantatas, madrigals, an oratorio, and an opera, contributed largely to form the taste of the succeeding composers, particularly Purcell, Clari, Steffani, and Alessandro Scarlatti. S. was renowned for his exquisite voice and polished manner; and when engaged in Venice, instructing a young lady of rank, who lived in a criminal intimacy with a noble Venetian, the musician and his pupil became mutually enamoured, fled to Rome, and were married there. They were traced thither by two bravos in the employ of the Venetian, who discovered them in the church of San Giovanni Laterano, where S. was assisting at the performance of an oratorio of his own; and both assassins, it is said, were so captivated with his voice and strains, that they at once abandoned their object, and betrayed to him the plot in which they had been engaged. Pursued by other bravos to Turin, S. was stabbed, but not mortally, when lodged in the palace and under the protection of the Duchess of Savoy. Some years afterwards, however (about 1670), he went to Genoa, in pursuance of an engagement to compose an opera, and the day after his arrival, both he and his wife were mortally stabbed in their bedchamber by the emissaries of their unrelenting persecutor.

STRADE'LLA, a city of Northern Italy, 10 miles south-east of Pavia, with 6977 inhabitants. It is situated on the slope of a hill. S. was formerly a fortified city, depending on the bishops of Pavia.

STRAFFORD, Thomas Wentworth, Earl of, eldest son of Sir W. Wentworth of Wentworth, Woodhouse, Yorkshire, was born April 13, 1593. In 1611, he married Lady Margaret Clifford, eldest daughter of the Earl of Cumberland. Subsequently, he was chosen member of parliament for the county of York. In 1615, he was appointed *Custos Rotulorum* for the West Riding of the same county. Being again returned to parliament for Yorkshire in 1621, shortly after his election he took up his residence in London. Slighted by the Duke of Buckingham, who then ruled the court and cabinet of Charles I., Wentworth signalised himself as an opposer of the administration. In 1626, he was made sheriff of his county, with the view of preventing him from attending parliament. So resolutely did he oppose the arbitrary royal loan, exacted in the following year, that the government deemed it advisable to put him in prison. But Buckingham was little aware of the energy of his opponent. S., having obtained his release, came to the following parliament, resolved to make his power felt both by king and minister. He spoke eloquently on the question of grievances, and was conspicuous in obtaining the royal assent to the Petition of Right. He was obviously a man worth gaining; and his patriotism, if it had any genuine element, was, unhappily, not strong enough to withstand the temptation now held out to his personal ambition. With his elevation to the peerage, as Baron Wentworth, in 1628, he seems not only to have lost all solicitude for popular liberty, but openly to have become its most determined enemy. As President of the 'Council of the North,' he seems to have abused his powers not only for political purposes but often simply to gratify his own pride. The legality of the jurisdiction exercised by the council, created by Henry VIII., was altogether very doubtful; and interdicts against it were at various times applied for from the Courts at Westminster. S. declared openly that he would 'lay by the heels' any judge presuming to interdict the council from the exercise of such powers as he chose to hold that it possessed. Nevertheless, this was done by Judge Vernon. In 1631, S. was made Deputy of Ireland, and in 1639, Earl of Strafford and Lord Lieutenant of Ireland. According to his views, that country belonged to the crown by right of conquest, and neither the natives, nor the descendants of the conquerors themselves, had any rights which could interfere with its sovereignty. His government was of despotic violence, but the administration of justice, in ordinary cases, was prompt and vigorous. Outrage was suppressed, and commerce flourished under his strong hand. Understanding fully the feelings, policy, and resources of the party to which he had originally belonged, S. had matured a vast political scheme, to which, in his confidential correspondence, he gave the expressive name of 'Thorough.' His object was to do in England what Richelieu was doing in France—to make Charles as absolute as any continental monarch; to put the estates and personal liberty of the whole people at the disposal of the crown; to deprive the courts of law of all independent authority; and to punish with merciless severity all who murmured against the government, or who applied to any tribunal for relief from its despotism. Happily, the people of England were too strong for him. On his entering the House of Peers, on the meeting of the Long Parliament in 1640, the message from the House of Commons was called in, and Mr Pym, in the name of the Commons of England, impeached 'Thomas, Earl of Strafford,' of high treason. This course was afterwards abandoned, and the Commons proceeded by bill of attainder. It passed the House on April 21, 1641. Immediately after, it passed in the House of Lords, and received the royal assent. S. certainly merited his fate, but nothing can excuse the cowardice of the king. The earl was executed on May 12, 1641. The attainder was reversed in the reign of Charles II., and his son succeeded to the honours.—See Hallam's *Constitutional History;* Macaulay's *History of England,* with authorities cited in these works.

STRAIN, the name given to any one of the periods into which a musical composition is divided by double bars, the strain being further subdivided into periods, sections, phrases, and feet.

STRAITS SETTLEMENTS are the British settlements in the Straits of Malacca, comprising Singapore (q. v.), Malacca (q. v.), and the Prince of Wales Island (q. v.), or Penang, including the province of Wellesley. Each of these settlements is described in its own place, and its area and population given. They were transferred in April, 1867, from the Indian government to that of the Secretary of State for the Colonies. The entire area is about 1225 sq. m. Pop. (1861) 282,831; (1881) 423,384.

STRA'LSUND, a fortified town and seaport of Prussia, province of Pomerania, is situated on a narrow strait called the Strela Sunde, which divides the mainland from the island of Rügen. It forms an island, partly surrounded by the sea and partly by large pools of salt water, and is connected with the mainland by three bridges. The natural strength of the place is greatly increased by formidable fortifications. Right in front of the harbour lies the fortified island of Dänholm. S. has narrow but pretty regular streets, and many of the houses are finely gabled, which gives the town a quaint and ancient look. S. carries on a large export-trade,

especially in malt and corn, and has manufactures of leather, sugar, starch, mirrors, and cards. Pop. (1880) 29,492. S. was founded in 1209 by Prince Jaromar of Rügen, became a member of the Hansa, and rapidly rose into importance. During the Thirty Years' War, it was unsuccessfully besieged (1628) by Wallenstein; and after being, with some alternations of fortune, in the possession of Sweden for about 200 years, it finally passed to Prussia in 1815, but still retains a considerable amount of its ancient municipal independence.

STRANGE, Sir Robert, eminent as an engraver, was born in Pomona, one of the Orkney Islands, July 14, 1721. After some little abortive study of law at Edinburgh, he was apprenticed to an engraver there of the name of Cooper, under whom he made rapid progress. In 1745, he deserted art for arms, joining the army of Charles Edward, not so much from enthusiasm in his cause, as to find favour with a Miss Isabella Lumisden, who would only consent to be gracious to him on that romantic condition. The only exploit recorded of him in this relation is not one of glorious battle. After the final collapse of the adventure, he was in hiding in the house where Miss Lumisden resided; and on occasion of its being searched by the soldiery, he shrouded himself under the folds of her ample petticoat, and thus cleverly evaded detection. It is extremely satisfactory to know that very soon after the lady requited his heroism by marrying him. He now went abroad with his wife, and at Paris he prosecuted his art under the tutelage of the celebrated Le Bas, and afterwards of Descamps. In 1751, he returned to Britain, and settling himself in London, speedily attained the very highest rank in his profession. On again going abroad in 1760 to execute plates of the most famous pictures of the old masters, his eminence was recognised by the academies of Paris, Rome, Florence, Bologna, and Parma, all of which conferred on him the honour of membership; and subsequently in 1787, the distinction of knighthood testified to the high favour he found in his own country. After a life of honourable and successful industry, he died on 5th July 1792, leaving a handsome fortune to his family. To this day, S. is ranked at the very head of British engravers, and his reproductions of the nobler specimens of the old masters are much prized by the connoisseur. In the very amusing work entitled *Memoirs of Sir Robert Strange, Knight, Engraver, and of his Brother-in-law, Andrew Lumisden, Private Secretary to the Stuart Princes* (2 vols. 1855), by James Dennistoun of Dennistoun, a full account will be found of him, with an intelligent criticism of his chief works.

STRANGLES is a contagious eruptive disorder peculiar to young horses. It is ushered in by sore throat and cough, a muco-purulent nasal discharge, and the eruption of a swelling in the space between the branches of the lower jaw. In about ten days, this swelling comes to a head, bursts, and in favourable cases the patient is soon well again. From exposure to cold, poverty, or other causes, the swelling, however, occasionally appears in less favourable situations, as about the glands lying within the shoulder, in those of the groin, or even in those of the mesentery. Such irregular cases are apt to be protracted, accompanied by much weakness, and sometimes prove fatal. Bleeding, physic, and irritant dressings are injurious. Good food and nursing, with fomentations to the throat, and steaming of the head, favour the healthier maturation of the swelling. When there is debility, coax the animal to eat by offering him at short intervals small quantities of scalded oats, malt, bran, or green food, and allow him several times daily a pint of sound ale.

STRANGULATION may be defined to be 'an act of violence in which constriction is applied directly to the neck, either around it, or in the fore part, so as to prevent the passage of air, and thereby suddenly suspending respiration and life.' —Taylor's *Principles and Practice of Medical Jurisprudence*, 1865, p. 673. This definition, as Dr Taylor observes, obviously includes Hanging (q. v.). *Hanging* has been already briefly noticed in a special article, but the medico-legal relations of this and the other varieties of strangulation have still to be considered. The primary cause of death from hanging has been considered in the article just referred to, but it is necessary to add that if a person who has hanged himself has been cut down sufficiently soon to allow of the respiratory process being restored, he is by no means safe: death often taking place from secondary effects at various periods after the accident. The most prominent morbid appearance in these instances was extreme congestion of the brain.

When the suspension of the body has not continued for much more than five minutes, and the parts about the neck have not suffered violence, there is a probability that resuscitation may be established; although many cases are recorded, when after only a few minutes' suspension, it has been found impossible to restore life. It is believed that death takes place very rapidly, and without causing any suffering; the violent convulsions that are so often observed being similar to those which occur in epilepsy. A man named Hornshaw, who was on three occasions resuscitated from hanging—a feat which he performed in London for the amusement of the public—stated that he lost his senses almost at once; and other persons who have been restored state that the only symptoms of which they were conscious were a ringing in the ears, a flash of light before the eyes, then darkness and oblivion. The treatment to be adopted after the patient has been cut down may be briefly summed up as follows: Exposure to a free current of air, cold affusion if the skin is warm, the application of ammonia to the nostrils, of mustard poultices to the chest and legs, and of hot water to the feet, and the subsequent abstraction of blood if there should be much cerebral congestion; artificial respiration should also be tried if the above means fail to re-establish the respiratory process. From the post-mortem appearances, together with circumstantial evidence, the medical practitioner is not unfrequently called upon to decide such questions as these: Was death caused by hanging, or was the body suspended after death? Was the hanging the result of accident, homicide, or suicide? For the full discussion of these questions, the reader is referred to chapter 53 of Dr Taylor's volume. In case of strangulation from other causes than that of hanging, the post-mortem symptoms are similar, but the injury done to the parts about the neck is commonly greater. In manual strangulation, the external marks of injury will be in front of the neck, about and below the larynx; and if death has been caused by a ligature, the mark round the neck will be circular, whereas in hanging it is usually oblique. The internal appearances are much the same as in the case of hanging.

STRA'NGURY (Gr. *strangx*, that which oozes out, *oureo*, I micturate) is perhaps to be regarded as a symptom rather than a disease. It shews itself in a frequent and irresistible desire to pass water, which is discharged, however, in very small quantity, and whose passage from the bladder is accompanied with

scalding and cutting pains along the course of the urethra. The pain often extends to the bladder and even to the kidneys, and is sometimes so severe as to implicate the lower bowel (the rectum), and to produce the straining condition known as *Tenesmus*. It is usually caused by irritating substances in the urine, especially by *cantharides* or Spanish flies (whose irritant principle is liable to find its way into the renal secretion, whether the above-named drug is taken internally or merely applied to the skin as a blistering agent), and by oil of turpentine, when administered internally in small doses, and is generally present in cases of gravel. Severe as the affection is, it is very transitory, and yields readily to treatment. After the removal of the cause, if it can be recognised and the removal is possible, a drachm of laudanum in a wine-glassful of starch mucilage should be thrown into the lower bowel, and mild mucilaginous draughts (of barley-water, for example) should be freely given in order to render the urine less irritating. The warm-bath is also useful, and if it cannot readily be obtained, hot local fomentations often tend to relieve the pain and allow the urine to pass more freely.

STRANRAE'R, a royal and parliamentary burgh, seaport, and market-town of Wigton, Galloway, at the head of Loch Ryan, 6 miles north-east of Portpatrick. There are no manufactures, the town depending almost wholly on the agricultural interest. The town is well known for the valuable oyster fishery carried on in Loch Ryan. In 1872, 439 vessels, of 64,191 tons, entered and cleared the port. Agricultural produce and cattle, leather, and shoes are exported. Pop. of royal burgh 3615; of parliamentary burgh, which unites with the Wigton burghs in sending a member to the House of Commons, 6342.

STRAP, in Carpentry, an iron band fixed round two or more timbers, sometimes with branches along each, to hold them all firmly together.

STRA'SBOURG (Ger. *Strassburg*), an important city of Germany, province of Alsace-Lorraine, was formerly capital of the French dep. of Bas Rhin, but in 1871 was ceded to Germany. The city stands at the confluence of the Ill and the Brusche, and not far from the left bank of the Rhine, 89 miles north of Basel, and 312 miles east of Paris by railway. The streets are irregular, the houses old-fashioned. The citadel, built by Vauban, 1684, was demolished by the Germans during the bombardment of 1870, but in 1873 they began to rebuild it, and this, in conjunction with a system of 12 detached forts being erected at several miles' distance from the walls, will make the position one of great strength. The most celebrated building is the minster, or cathedral, founded in 504 A. D., and, along with the cathedrals of Cologne and Freiburg, one of the most sublime specimens of Gothic architecture. It is rich in sculpture. The spire is 466 feet in height, or 33 feet higher than St Peter's at Rome, and is only surpassed in altitude by two edifices of human construction—the pyramid of Cheops and the cathedral of Vienna. It has a remarkable astronomical clock representing the planetary system. For an account of the cathedral, see Schreiber, *Das Münster in S.* (Freib. 1828). Other notable structures are the Protestant church of St Thomas, with the tomb of Marshal Saxe, and various monuments to distinguished S. scholars; the *Temple Neuf*, or New Temple, the synagogue of the Jews, the Town-house, the Palace of Justice, the arsenal, the episcopal palace, and the theatre. The university of S. was the only complete university in France—i. e., the only one which has the full complement of faculties—besides that of Paris. It was founded in 1621, became specially famous in the branches of medicine and philology, went to the ground during the great Revolution, and its place was supplied by an *Ecole Centrale*. In 1803, a Protestant academy was established with 10 chairs, for teaching theology, philology, philosophy, and history. Five years later, Napoleon founded an imperial academy, with faculties of law, medicine, physical science, and philosophy; and in 1819, a partial fusion of these academies took place, greatly to the benefit of both. On the conclusion of the Franco-Prussian war in 1871 the university was reorganized, and in May of the following year (1872) was solemnly opened.

The famous library of S., consisting of nearly 200,000 volumes, and rich in *Incunabula* (q. v.), was entirely destroyed by fire during the bombardment in 1870, but has been to some extent replaced by a library of about 120,000 volumes, contributed by the Germans. The trade of S., especially its transit-trade, is very extensive, and it has a great variety of manufactures—beer, ham, sausages, fat-liver pies, watches and clocks, leather, cottons, woollens, silks, cutlery, musical and mathematical instruments, jewellery, brandy, potash, tobacco, &c. The Basel and Baden railways, the railway to Paris, and the communication with Rotterdam and London by means of the Rhine steamers, as well as with the Danube and all the great rivers of France by means of canals, have greatly added to its facilities for conducting commerce. The country round about S. is fertile and carefully cultivated, with beautiful gardens, mansions, and villages. Pop. of the town in 1880, 104,501, of whom nearly one-half are Catholics.

S., the *Argentoratum* of the Romans, was extant before the time of Cæsar, but is first mentioned by Ptolemy. The Romans had a manufactory of arms here. In the 5th c., it appears to have received the name of *Strata-Burgum* or *Strata-Burgus*, perhaps from the invading Franks, whence the modern German Strassburg and the French Strasbourg. It became a free town of the German Empire, and in 1681 passed with the rest of Alsace into the hands of the French, under whom its population and prosperity have greatly increased. On Sept. 28, 1870, Strasbourg capitulated to the Germans, and 451 officers and 17,000 men laid down their arms.

STRA'TEGY is defined by military writers to be the science of manœuvring an army out of fire of the enemy, as *tactics* is the art of managing it in a battle, or under fire. Strategy is the greater science, as including all those vast combinations which lead to the subsequent available displays of tactics. A good strategist has to attend to the establishing of his bases and dépôts, although some brilliant generals have dared to act without these last aids—notably, Sherman in America in 1864, and Wellington in 1813, advancing from Portugal through Spain into France. The strategist must know how to diffuse the influence of his arms over a broad area, while yet holding his force well in hand to strike crushing blows. Such was Wellington's Salamanca campaign; in which, though retreating himself to his former base, he compelled the French to evacuate Valentia.

Strategy must not be confounded with stratagem, although there is relationship between the two. Stratagem is any device for deceiving the enemy as to the point or strength of an attack. Such are ambuscades, feints, bugle-calls to imaginary troops, concealment of infantry by clouds of cavalry, and many other efforts.

STRA'TFORD, a thriving town of Essex, on the Lea, 3 miles east of London. It is the seat of various and extensive manufactures. There are flour-mills, distilleries, and chemical works. In

the town and its suburbs, many London merchants have built residences. The prosperity of the town has been much increased by its connection with the Eastern Counties Railway. Pop. (1851) 10,586; (1861) 15,994; (1881) 38,489. On the opposite side of the Lea is the parish of Stratford-le-Bow, with about 30,000 inhabitants.

STRATFORD-UPON-AVON, a municipal borough and township of England, in the county of Warwick, and 8 miles south-west of the town of that name, is situated on the right bank of the river Avon. Pop. (1881) 8053. The town is neatly built, and has quite a modern look, most of the old houses having disappeared. Some trade is carried on in corn and malt. S. is the birthplace of Shakspeare. The house in which he was born is still preserved, and is visited by enthusiastic pilgrims from all quarters of the world. The great poet is buried in the parish church.

STRATFORD-DE-REDCLIFFE, STRATFORD CANNING, VISCOUNT, English diplomatist, is son of a London merchant, and cousin of the celebrated George Canning. He was born 1788, educated at Eton, and entered himself of King's College, Cambridge, in 1806, but left in 1807, on receiving an appointment as précis writer in the Foreign Office. He was appointed secretary of embassy at Constantinople in 1809. He returned to Cambridge in 1812 for the purpose of resuming his studies, and took the degree of M.A. He was sent as envoy to Switzerland in 1814. About this time he published an ode full of spirit and power, entitled *Buonaparte*. It is called by Lord Byron a 'noble poem.' In 1820, he went as plenipotentiary to the United States, and remained at Washington three years. In 1824, he was sent on special missions to St Petersburg and Vienna. In 1825, his introduction to Eastern diplomacy commenced with his appointment by Mr Canning, then foreign secretary, as ambassador extraordinary to the Sublime Porte. Here his good offices were warmly exerted on behalf of the Greeks. In 1831, he was accredited with a special mission to Turkey, to fix the boundaries of the new kingdom of Greece, and to settle the treaty in virtue of which Otho ascended the Greek throne. He went to Madrid and Lisbon on a special mission in 1832. He had previously sat in the House of Commons for Old Sarum and Stockbridge during a brief interval in his diplomatic career. In 1834, he was elected for King's Lynn, which he represented until 1841, when, having twice refused the governor-generalship of Canada, he was appointed by the government of Sir Robert Peel ambassador at Constantinople. Here his influence was strenuously exerted in the cause of civilisation and progress. In 1852, the Derby administration recommended the crown to confer upon him the title and dignity of Viscount. When the long-standing quarrel between the Greek and Latin monks in Palestine involved the powers of Europe in the struggle, S. remembered how the Emperor Nicholas of Russia had, from 1829 to 1853, sought to establish a predominant influence, excluding all others, over the Porte, with the view of settling the future destinies of Turkey, to the profit of Russia when the propitious juncture arrived. At the time when Prince Menchikoff was sent to Constantinople upon a mission from the czar, S. was absent in England on leave. He returned to Constantinople in April, 1853, and prepared to resist M.'s demands. The keenly contested diplomatic struggle between S. and the Russian ambassador extraordinary is narrated with dramatic power by Mr Kinglake in his *Invasion of the Crimea*, who calls S. the 'Great Eltchi.' S.'s influence with the Porte prevailed, for, to adopt the words of Mr Kinglake, 'as though yielding to fate itself, the Turkish mind used to bend and fall down before him;' and he placed on England the responsibility of a defensive alliance with the sultan against the czar. As Russia would not withdraw her troops from the principalities, the sultan declared war against Russia, and France and England came to the aid of the Porte. S. retired from the Turkish embassy in 1858 upon a pension. He has since taken a frequent part in the debates of the Upper House on questions of foreign policy. He was created Knight of the Garter in 1869.

STRATH, a Gaelic word signifying a broad valley, is often prefixed in the north of Scotland to the names of rivers, as Strathearn, Strathallan, Strathnairn, Strathspey, in each of which cases it signifies the open valley through which the river flows. In such cases, however, as Strathmore (great valley), it simply signifies a valley-like depression. In the south of Scotland, the word is not used, and the Northumbrian word *dale* is made use of to express the same thing, as Clydesdale, Annandale, Teviotdale, Tweeddale.

STRATHA'VEN, a town of Scotland, in Lanarkshire, about a mile west of Avon Water, and 14 miles south-east of Glasgow. On the north side is the picturesque ruin of Avondale Castle, and from 5 to 7 miles south-west are the battle-fields of Drumclog and Loudoun Hill. The more recently built part of the town is neat and spacious. Pop. about 40,000, chiefly engaged in weaving and trading in cheese and cattle.

STRATHCLY'DE. In the 8th c., the ancient confederacy of the Britons was broken up into the separate divisions of Wales and English and Scottish Cumbria. Scottish Cumbria, otherwise called S., thenceforth formed a little kingdom, comprising the country between Clyde and Solway, governed by princes of its own, and having the fortress-town of Alclyde or Dumbarton for its capital. Becoming gradually more and more dependent on Scotland, it was annexed to the Scottish crown at the death of Malcolm I., on failure of the line of native sovereigns. Edgar bequeathed S. to his youngest brother David, again separating it from the crown of Scotland, which went to his intermediate brother, Alexander I. David held it throughout Alexander's reign in spite of that king's opposition, and on the death of Alexander without issue in 1124, it was permanently reunited to the kingdom of Scotland under David I.

STRATHMO'RE (the Great Valley), the most extensive plain in Scotland, is a low-lying tract extending across the country from Dumbartonshire north-east to Stonehaven in Kincardineshire, is bounded on the north by the great mountain-rampart of the Highlands, and on the south by the Lennox, the Ochil, and the Sidlaw Hills, and is 100 miles long and from 5 to 10 miles broad. In a stricter sense, however, S. proper extends only from the neighbourhood of Perth to that of Brechin in Forfar, a distance of about 40 miles.

STRATHSPEY', a kind of Scottish national dance slower than the reel, which is said to derive its name from having been first practised in the district called Strathspey.

STRATIO'TÉS, a genus of plants of the natural order *Hydrocharideæ*, having a 2-leaved spathe with numerous barren flowers, one female flower in each spathe. *S. aloides*, popularly called WATER SOLDIER, is common in lakes and ditches in the east of England. It is a singular plant with numerous leaves, which are strap-shaped and spring from the root, from which also springs the two-edged flower-stem,

bearing the spathe with beautiful and delicate white flowers. In autumn the whole plant disappears, the root alone remaining at the bottom of the water;

Water Soldier (*Stratiotes aloides*).

from which a number of young plants arise in spring, filling up ditches, so that nothing else can grow in them. It is a very ornamental aquatic plant.

STRA'TUM, pl. *strata* (Lat. strewn or spread out), the term applied by geologists to the layers into which most of the rocks that form the crust of the earth are divided. It implies that the layers have been spread out over the surface, and that they were formed in this way we may infer from the deposits that are now taking place in lakes and seas into which rivers laden with muddy sediment empty themselves.

All the aqueous rocks, which cover so large a proportion of the earth's surface, are stratified. They were formed from the abraded materials of older rocks (aqueous or igneous), which have been washed down and rearranged. The kind of rock produced depended upon the material to which the carrying agent had access. Fine mud would produce shales, sand sandstones, and calcareous matter limestones. In a section, these different kinds of rocks are frequently found to interchange within a short space. This is produced either by the water obtaining different materials, or changing its velocity. Thus the fine sediment which has fallen from slowly flowing water may be covered by a layer of sand brought down by a flood, and this again may have spread over it a covering of shells and corals, and such changes may go on alternately for an indefinite period. Each of the different beds composed of the same kind of material is called a stratum. Thus, in the series mentioned, there would be a 'stratum' of clay, one of sand, and then one of calcareous matter. An assemblage of strata having a common age is called a 'formation,' and this term is also extended to rocks which agree in their composition or origin. Thus we speak of stratified and unstratified, aqueous and igneous, freshwater and marine, primary and secondary, metalliferous and non-metalliferous formations. As a formation is composed of many different beds, so a stratum is frequently made up of several 'laminæ' or 'layers.' The laminæ have a more or less firm cohesion, but the strata easily separate from each other. Sometimes the cohesion of the laminæ is so great, that it is as easy to split the rock against as with the grain. In such compact rocks the lamination is obscure, or altogether imperceptible in fresh specimens, but whenever they are exposed to the influence of the weather, it becomes obvious. The laminæ have been produced by short interruptions in the deposition, similar to what might be the result of tidal or other intermittent action. The degree of cohesion may be the result of rapid succession in the acts of deposition, but it is frequently produced by metamorphic action subsequent to deposition. The planes of stratification want the complete coalescence characteristic of lamination; when the contiguous layers are closely united, it is the result of the adhesion of two bodies, and not of their coalescence into one.

STRAU'BING, a town of Lower Bavaria, on the right bank of the Danube, 25 miles south-east of Ratisbon, lies in a very fertile valley, and carries on a river-trade in corn, cattle, and horses. In a little chapel here there is a monument to Agnes Bernauer (q. v.). Pop. 11,408.

STRAUSS, DAVID FRIEDRICH, author of the famous *Leben Jesu*, was born on the 27th January 1808, at Ludwigsburg, in Würtemberg. His education was begun in his native town, and completed in the theological seminaries of Blaubeuren and Tübingen. In 1830, his head filled with Hegel's philosophy and Schleiermacher's theology, he entered on the simple life of a country pastor, but already in the following year he was in Maulbronn acting as professor in the seminary, and went thence to Berlin for six months to continue his Hegelian studies, and hear the lectures of Schleiermacher. Returning to Tübingen in 1832, he became *repetent* in the theological seminary, and in the next years held also philosophical lectures in the university as a disciple of Hegel. Known as yet only to a narrow circle, he became all at once a man of mark by the publication, in 1835, of his *Life of Jesus critically treated* (2 vols. Tüb.; 4th ed. 1840; translated into English, 1846). In this work, written from the point of view of a Hegelian philosopher, and designed only for the learned, he attempted to prove the received gospel history to be a collection of myths gradually formed in the early Christian communities, and sought, by an analytical dissection of each separate narrative, to detect, where it existed, a nucleus of historical truth free from every trace of supernaturalism. The book made a real epoch in theological literature, and produced a violent excitement in and out of Germany, calling forth numberless replies from opponents, frightening many by its bold disregard of consequences back into the ranks of orthodoxy, and stirring up others to similar investigations. The first consequence to the author was his dismissal from his academical position in Tübingen, and transference to the Lyceum of Ludwigsburg. He resigned the new post, however, very soon in 1836, and retired into private life at Stuttgart, to have leisure to defend himself. In 1837, he published his *Streitschriften* against his opponents; and in 1838, *Zwei friedliche Blätter*, a more conciliatory exposition of his views. Early in 1839, he was called by the Board of Education in Zürich to be Professor of Dogmatics and Church History in the university; but the step raised such a storm of opposition amongst the public, that the proposition had to be dropped, and even the government itself had to resign in the same year. Thrown back on his literary labours, S., who had published during the year his *Charakteristiken und Kritiken*, sent forth shortly afterwards his second great work, *Die Christliche Glaubenslehre*, a review of Christian dogma 'in its historical development and its struggle with modern science' (Tüb. 1840—1841). This formed a natural sequel to the purely critical

investigation of the origins of Christianity in the first work. When S., after a long period of silence, next appeared on the literary field, it was no longer as a professed theologian. In 1847, he drew attention by a work entitled, *Der Romantiker auf dem Throne der Cäsaren, oder Julian der Abtrünnige*, full of direct allusions to the political situation of the day. His fellow-townsmen put him forward as a candidate for the German revolutionary parliament of 1848, but he was unable to stand against the clerical influence brought to bear upon the country-people of the district. His speeches on this occasion were published under the title of *Six Theologico-political Popular Addresses*, and his native place compensated the defeat by sending him as its representative to the Würtemberg Diet. From this position, however, when he unexpectedly displayed conservative leanings, and incurred a vote of censure from his constituents, he retired before the end of the year. A life of the Swabian poet Schubart (1849), and another biographical work, *Christian Märklin, a Picture of Life and Character from the Present* (1851), giving an insight into his own mental development, were his next literary efforts, before another period of silence. His third period of activity was opened in 1858 by a remarkable life of the Reformer, Ulrich von Hutten, followed up by the publication of Hutten's *Dialogues* in 1860. These books, though primarily of strictly historical interest, were nevertheless calculated for the present state of religious affairs in Germany, and contained fiercely contemptuous denunciations of the tactics of the reactionary party in the church. A collection of miscellaneous *Minor Writings* appeared in 1862, and a new *Life of Jesus, composed for the German People*, in 1864 (Eng. translation, 1865). The title of the work indicates its popular cast, the peculiar features of it being a long critical statement of the labours of others in the same field down to the present day, and an attempt to construct a life out of all the positive results that have been gained. The mythical hypothesis is retained, but applied differently. Still later publications, which appeared in 1865, are *Der Christus des Glaubens u. der Jesus der Geschichte* (Berlin), a criticism of the newly published lectures of Schleiermacher on the life of Jesus, and a brochure, *Die Halben u. die Ganzen*, directed against Schenkel and Hengstenberg. The polemic against Schenkel, Professor of Theology in Heidelberg, a leader of the liberal party in the church of Baden, and author of the *Charakterbild Jesu* (1864), arose out of an earlier notice of this book by S. In 1872 he published his last work, *Der alte und der neue Glaube* (translated under the title *The Old Faith and the New: a Confession*), in which he endeavours to prove that Christianity as a system of religious belief is practically dead, and that a new faith must be built up out of a scientific knowledge of nature. The literary, critical, and polemical powers of S. were of the highest order. No more effective prose than his has been written in Germany since the days of Lessing. He died Feb. 8, 1874.

STRAWBERRY (*Fragaria*), a genus of plants of the natural order *Rosaceæ*, suborder *Roseæ*, tribe *Potentillidæ*, remarkable for the manner in which the receptacle increases and becomes succulent, so as to form what is popularly called the fruit; the proper fruit (botanically) being the small *achenia* which it bears upon its surface. The genus differs from *Potentilla* (q. v.) chiefly in having the receptacle succulent. The calyx is 10-cleft, the segments alternately smaller; the petals are five; the style springs from near the base of the carpel. All the species are perennial herbaceous plants, throwing out runners to form new plants; and the leaves are generally on long stalks, with three leaflets, deeply toothed. One South American species has simple leaves. Only one species, the WOOD S. (*F. vesca*), is truly a native of Britain. It is common in woods and thickets. Its fruit is small, but of delicious flavour. Another species, the HAUTBOIS S. (*F. elatior*), is not unfrequently to be seen in woods and hedges, but has probably escaped from gardens. It is really a native of North America. The many kinds cultivated in gardens are regarded as varieties of these species, and of the CAROLINA S. (*F. caroliniana*), the PINE S. (*F. grandiflora*, or *F. ananas*), and the CHILI S. (*F. chilensis*), American species, the leaves and fruit of which are larger than those of the Wood Strawberry. In no genus, however, are the species more uncertain to which the cultivated kinds are to be referred. Some of these are remarkable for the large size of the fruit. New varieties are continually coming into notice, and the utmost care is necessary to keep the larger and finer varieties from degenerating. The cultivation of the S. is most extensively carried on in Britain and America. New kinds are produced from seed; but plantations of strawberries are generally formed of the young plants, which are abundantly produced by runners. The rows are from eighteen inches to two feet apart, according to the kind. The finest fruit is said to be produced when the plants are kept distinct from each other in the rows, but this is not generally done. Tiles are sometimes placed around the plants and under the fruit; and it is an old English practice to lay straw between the rows, to preserve the fruit from rotting on the wet ground, from which the name S. has been supposed to be derived; although more probably it is from the wandering habit of the plant, *straw* being a corruption of the Anglo-Saxon *strae*, from which we have the English verb *stray*. S. beds require to be renewed after a few years. Strawberries are often forced in hothouses, in order to produce the fruit at a very early season. The uses of the S. as a dessert fruit and for preserves are well known. There is no more wholesome fruit.

The ALPINE S. (*F collina*), a native of Switzerland and Germany, differs considerably from the other kinds in its taller stems and more erect manner of growth. The fruit, which is either red or white, is not very large, but is produced in great abundance, and, unlike other strawberries, parts from its calyx almost on being touched. The Alpine S. continues to produce fruit long after the other kinds.

The INDIAN S. (*F. indica*), a native of the Himalaya, requires only a little protection in Britain from severe frost, and with this care grows luxuriantly and produces fruit in abundance. The flowers are yellow, not white, as in other strawberries, and are not produced upon common flower-stalks rising from the centre of the plant as in the other species, but upon single-flowered stalks, which spring from the axils of the leaves upon the runners. The fruit is very beautiful, not hanging down like other strawberries, but growing with its apex upwards. It is not, however, of good quality.

STRAW-MANUFACTURES. The industrial applications of the straw of wheat are of great commercial importance, especially that of plaiting, which is one of the oldest arts practised by mankind, many specimens having been found in the tombs of the ancient Egyptians, and mention being made of plaiting by Herodotus and other early writers. The earliest notice we have of its systematic use in Europe as an article of clothing is in the records of the reign of Mary, Queen of Scots, who we are told, observed that the peasants of Lorraine

wore hats made of straw plait, and that this manufacture was beneficial to them, and she consequently conceived the idea of introducing it into Scotland, which was done about the year 1652, but without much success. Her son, James I., however, carried it into England, where it soon throve, and has been from that time a permanent branch of industry. It was first regularly established in Bedfordshire, which has ever since been the chief seat of the trade.

At first, the plait was what is called *whole straw;* that is, the straw was cut into suitable lengths without knots, and merely pressed flat during the operation of plaiting, and so it continued until the reign of George I., when it was in great demand for ladies' hats, and some plait was made of split straw. Since that time, this kind has been chiefly used, and a much improved method has been substituted for the clumsy one of using a common knife for splitting it. The instrument now employed (fig. 1) is made of steel, and consists of a number of little square blades set in a circular manner around the stem, which at one end terminates in the point *a*, and at the other is bent and fixed into the handle *b*. The point, *a*, being inserted into the hollow of the straw, is pressed forward, and cuts it into as many strips as there are blades in the cutting-tool; these vary in number according to the fineness of the work to be produced.

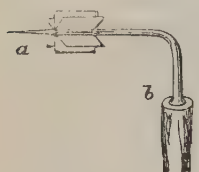


Fig. 1.

It is found that the fine straw-plaiting, which is now produced better in England than in any other country except Italy, can only be made from one or two varieties of wheat, that called the White Chittim being generally preferred, and next to it the Red Lammas, which only succeed as a straw-crop upon the light rich soils of the more southern of the midland counties. The harvesting is a matter of great anxiety, as the straw is liable to many injuries from wet and other causes. The value of this crop can be best understood by the fact that an acre will yield from 25 to 40 bushels of wheat, and from 15 cwts. to a ton of straw, which, when in good condition, is worth £7 or £8.

The crop is bought up by straw-factors, who employ people to draw the straw, and remove the ears, which are all cut off by hand for thrashing. The straws are afterwards cut into lengths, and cleared of the outer sheath or leaf; they are then sorted into various thicknesses by an apparatus consisting of a series of sieves about eight inches in diameter, arranged as in fig. 2, *a, a, a, a;* the boys who usually do this work hold a handful on end

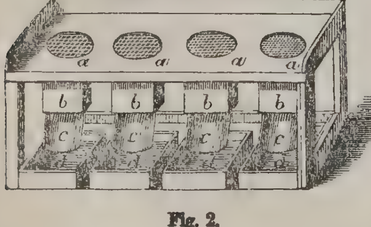


Fig. 2.

over the first sieve, which has the narrowest spaces, and the thinnest straws only fall through it; they are next placed on the second, and so on to the last. As they fall through each successive sieve, they pass down the hollow shafts *b, b, b, b*, by the shoots of tin or sheet-zinc *c, c, c, c*, into the boxes *d, d, d, d*, from which they are removed and tied into bundles ready for the splitters, who next take them in hand and reduce them to strips of the sizes required.

The plaits are made by women and children in their own cottages, and are collected by the dealers and sold in the Luton and Dunstable markets, in which the chief part of this business is transacted. They are very various in pattern, and are sold by the *score* of 20 yards, the prices ranging from 2*d.* to 3*s.* per score for the ordinary kinds, but very fine plaits have been known to fetch as high as £3 to £4 per score.

It is computed that 70,000 persons are employed in this trade, of whom nearly 60,000 are females and boys, and that they produce annually about 12,000,000 scores, or 240,000,000 yards of plait. The plait is made up into bonnets and hats chiefly at Luton and Dunstable, and sent up to the London warehouses for sale, whence they are sent to all parts of the world. A large trade is also done in the fine plaits of Tuscany; the Leghorn plaits are very fine, and fetch high prices.

Besides its value for plaiting, straw is now much used in the manufacture of Paper (q. v.).

STRELITZ, more properly *Streltzi* (arquebussiers), the ancient Russian militia-guard, first raised by Ivan Vassilevitch the Terrible, in the second half of the 16th century. At that time, and for long afterwards, they were the only standing army in Russia, and at times amounted to between 40,000 and 50,000 men. They were located at Moscow in time of peace, in a quarter of the capital which was set apart for them, and being the bravest and most trustworthy troops in the army, were made objects of special favour and distinctions. But like all such petted corps, the Roman Prætorians, the Turkish Janizaries, and the Egyptian Memluks, their general turbulence, frequent revolts against the government (notably during the Demetrian insurrections), and incessant conspiracies, rendered them more formidable to the Russian government than to external enemies. The S. having, at the instigation of the Grand Duchess Sophia and the chiefs of the Old Muscovite party, revolted against Peter the Great, that iron-handed ruler caused them to be decimated (1698) in the great square of Moscow, and the remainder to be banished to Astrakhan. The feeble remnant still manifesting their characteristic turbulence and disloyalty, Peter exterminated them almost completely in 1705. Few Russian families at present can claim kindred with the old Streltzi, but to this the family of Orloff (q. v.) forms a prominent exception, being descended from a Strelitz who was pardoned by Peter the Great while the axe was being raised over him.

STRENGTH OF MATERIALS. The strength of materials depends upon their physical constitution—viz., their form, texture, hardness, elasticity, and ductility.

The resistance of materials in engineering works is tested in reference to various strains; such are—1. Extension or tension; 2. Compression or crushing; 3. Transverse or cross strain; 4. Shearing strain; 5. Torsion or twisting strain.

1. *Extension.*—When a rod is suspended vertically, and a weight attached to its end tending to tear it asunder, all its fibres act equally, and its strength evidently depends on the strength of the individual fibres and their number, that is, the area of cross-section of the rod. The following table

gives the resistance to *rupture* of some of the most common materials:

	Per Square Inch.
Fine sandstone,	200 lbs.
Brick,	300 "
Common lime,	50 "
Portland cement,	240 "
Deal (timber),	5 tons.
Cast iron (ordinary),	6½ "
" Stirling's toughened,	12½ "
Wrought iron, boiler-plate,	20 to 24 "
" bars,	25 "
Cast steel,	60 "
Ropes (hemp), four-fifths ton per pound-weight per fathom.	

With regard to the elongation of materials under tensional strain, it has been observed that up to a certain limit, which is different for different substances, the elongation is proportional to the extending force, a physical truth the promulgation of which is due to Hocke (q. v.); up to this limit also the body nearly recovers its original form on the removal of the force: this limit is called the limit of elasticity. When this limit is passed, the permanent elongation or destruction rapidly increases until rupture takes place.

The extension of wrought iron is about $\frac{1}{10,000}$th of its length per ton of strain per square inch, and that of cast iron $\frac{1}{5000}$th. The limit of elasticity of wrought iron is attained under a strain of 12 tons per square inch; and in the case of American pine ½ ton per square inch.

2. *Compression or Crushing Strain.*—The strength of pieces of stone, wood, or iron, whose height is small in proportion to their area, and which absolutely crush under the strain, is proportional to the area of their horizontal section. The following table gives the resistance to crushing of some of the more common materials:

Cast iron,	50 tons per square inch.
Wrought iron,	16 " " "
Brickwork,	30 tons per square foot.
Sandstone,	200 " " "
Limestone,	490 " " "
Deal,	450 " " "
Oak,	650 " " "

Up to a certain strain, which is called the limit of elasticity, the diminutions in length of the body are proportional to the compressing force; and are practically the same in amount as the elongations in the case of tensional forces. In the case of wrought iron, the limit is 12 tons per square inch; after that strain, its shape and proportions become permanently altered; and where these are of consequence, as in most practical cases, we come to the limit of its utility, which is reached when the load is about 16 tons per square inch. It then oozes away beneath additional strain, as a lump of lead would do in a vice.

The mode of ultimate failure of cast iron is quite distinct from that of wrought iron. It crushes suddenly by the sliding off of the corners in wedge-shaped fragments, being a crystalline mass, without sufficient ductility to allow of its bulging horizontally; the angle of rupture at which these wedges slide off being tolerably constant, and varying from 48° to 58°. The limit of elasticity is attained in cubes of deal under a compression of 100 tons per square foot; and in those of oak, 150 tons per square foot.

Pillars, round or square, may be divided into three classes—1. Those whose height is not more than 5 times their diameter; 2. Those whose height is between 5 and 25 times their diameter; 3. Those whose height is at least 25 times their diameter. The first follow the same laws as cubes or pieces of small height above discussed, and are absolutely crushed; their strength being proportional to their cross section. The second are broken across, partly by crushing and partly by bending. The third give way purely from bending as with a transverse strain, and their strength is found by experiment to be directly proportional to the fourth power of their diameter, and inversely proportional to the square of their length. Thus, in the case of two long pillars of equal length, but of which one has its diameter double that of the other, the strength of the former will be 16 times that of the latter; from which will be apparent the advantage of the tubular form for pillars, as it gives a large diameter, combined with lightness.

In the case of long columns whose length is 25 or more times their diameter, if we represent the strength of a long cast-iron column of any dimensions by 1000, the strength of a wrought-iron column of the same dimensions will be 1750; of cast steel, 2500; of Danzig oak, 110; of red deal, 80.

3. *Transverse or Cross Strain.*—When a beam fixed at one end is loaded with a weight at the other, it is bent from its original form, and takes a curved shape. The fibres on the upper or convex side of the beam are extended, and those on the under or concave compressed; while at the middle of the beam, there are fibres which are neither extended nor compressed, where the compression ends and the extension begins: this surface of fibres is called the neutral surface. As long as the beam is not strained beyond the limit of its elasticity, the extensions and compressions for a given strain are nearly equal, and therefore the neutral surface passes through the centre of gravity of the cross section of the beam.

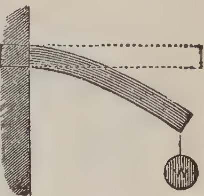


Fig. 1.

If we strain the beam beyond this limit, and approach the breaking strain, the extensions and compressions are no longer equal, and therefore the position of the neutral surface is not readily determined. For example, in the cases of stone and cast iron, the amount of compression is much less than that of the extension, and in the case of timber, greater. Also the extensions and compressions are no longer proportional to the strains. From these causes the position of the neutral axis, and the amount of strain on the different parts of the cross section at the moment of rupture, cannot be determined by theory.

Different theories have been proposed to determine the relative strength of similar beams, while their absolute strength is left to experiment. That of Galileo consists in supposing the beam incompressible, and that it gives way by extension turning round the lower edge, each point of the section giving an equal resistance before rupture. That of Mariotte and Leibnitz supposes the beam in like manner to turn round its lower edge, but considers that the resistance given out by each point of the section is proportional to its distance from that edge.

The theory now generally adopted consists in supposing the extensions and compressions to continue up to the point of rupture proportional to the strains, as is actually the case up to the limit of elasticity, and therefore, that the beam turns round a neutral axis, passing through the centre of gravity of the cross section, the force given out by each point being proportional to its distance from the neutral axis. This last theory is found to give the best results in the case of timber and

wrought iron, especially wrought iron arranged in the forms usual in girders. The second represents nearly the method of failure of stone, and the first that of cast iron.

Though none of these theories give accurate results, they yet give us means of determining, from particular experiments, the strength of any other beam whatever. For example, these theories agree in giving the strength of a rectangular beam to be proportional to the area of cross section multiplied by the depth, and inversely proportional to the length of the beam, since the strain increases directly as the length. This, when expressed mathematically, is

$$W = C\frac{bd^2}{l} \qquad \text{(I.)}$$

Where w = breaking weight in tons.
b = breadth of beam in inches.
d = depth of beam in inches.
l = length of beam in inches.
C = a constant number for beams of the same material, to be determined by experiment.

This result is borne out by experiment—that is to say, the constant C being determined by experiment on one beam, the strength of any other is found by multiplying its breadth by the square of its depth and by the constant C, and then dividing by its length. In the case of a beam supported at each end and loaded by a weight in the middle, as in fig. 2, the strength is also given by the formula,

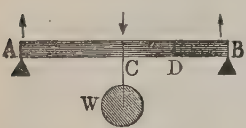


Fig. 2.

$$W = c\frac{bd^2}{l} \qquad \text{(II.)};$$

but c, in this case, is 4 times the value of C in the formula for a beam loaded at one end. The truth of this may be seen from the consideration that the beam ACB, fig. 2, may be treated as if it were two beams, each fixed at the point C at one end, and pressed upwards by the reaction of the supports at A and B, their other ends. This reaction is evidently equal to $\frac{W}{2}$; so that the breaking weight of the whole beam ACB, supported at both ends, resolves itself into that of the beam CB or AC of length $\frac{l}{2}$, acted on by the weight at one end $\frac{W}{2}$; this by formula (I.) is,

$$\frac{W}{2} = C\frac{bd^2}{\frac{l}{2}}$$

$$\text{or, } W = 4C\frac{bd^2}{l} = c\frac{bd^2}{l};$$

$$\text{therefore, } c = 4C \text{ or } C = \tfrac{1}{4}c.$$

Experiments on the transverse strength of beams are generally made in the manner of fig. 2. The following table, from experiments by Mr Barlow, gives the value of c for beams supported at each end and loaded in the middle:

	Tons.
Cast iron,	$13\frac{1}{2}$
Wrought iron,	12
English oak,	$2\frac{1}{7}$
Red pine,	$2\frac{4}{5}$

These numbers when substituted in the formula give the breaking weight, $\frac{1}{3}$d of this will be the safe load in practice. The transverse strength of cast iron is considered so good a test of its value, that in specifications of iron-work, it is generally required to be of such a quality that a bar of it, of certain dimensions, will bear a specified weight at the centre; for example, 'that a bar of it, 42 inches long, 2 inches deep, and 1 inch wide, set on bearings 36 inches apart, shall bear, without breaking, 30 cwt. suspended in the middle.' If a beam be loaded uniformly over its length, as in fig. 3, it will bear twice as much as if the load be condensed at the centre, as in fig. 2. Also, if the load be placed some distance from the centre, as at D, fig. 2, the load it will bear is to the load borne at the centre, C, inversely as the rectangle of the segments into which the beam is divided by the point of application of the load are to one another, that is, as AC × CB or $\frac{l^2}{4}$ is to AD × DB, from which it follows that it will bear less weight at the centre than at any other point.

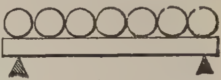


Fig. 3.

Since the strength of a rectangular beam is proportional to the square of the depth, multiplied by the breadth, it is evident that by increasing the depth and diminishing the breadth we shall, up to a certain limit, increase the strength of a beam without increasing its weight; for example, let A and B, fig. 4, be the sections of two beams, of which A is 2 inches broad and 2 deep, and B 4 inches deep and 1 inch broad, they are of the same sectional area —viz., 4 square inches, but the strength of B is to the strength of A as $4^2 \times 1$ is to $2^2 \times 2$, or as 16 to 8, that is, 2 to 1, that is to say, B is twice the strength of A. Hence arises the advantage of the double T forms so generally used in iron girders, fig. 5, the strength of which forms are proportional to the area of the top or bottom plates multiplied by the depth. For a beam of the form in fig. 5, loaded as in fig. 2, the following formula will give the breaking weight:

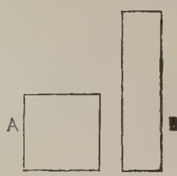


Fig. 4.

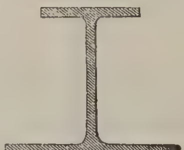


Fig. 5.

$$W = C\frac{ad}{l}$$

Where a = the area of the top or bottom flange in square inches.
C = 4 times the destroying load per square inch of the material, under direct tension or compression in tons.
d = depth of the beam in feet.
l = length between supports in feet.
W = breaking weight at the centre in tons.

For cast-iron beams, when the area of the bottom flange is made 6 times that of the top, which has been found by experiment to be the best arrangement, and the strength is measured by the tensional strain, supported by the bottom flange, that is, $6\frac{1}{2}$ tons per square inch,

$$C = 6\tfrac{1}{2} \times 4 = 26 \text{ tons.}$$

For wrought-iron beams,

$$C = 4 \times 20 = 80 \text{ tons for the lower flange,}$$
$$\text{and } C = 4 \times 16 = 64 \text{ tons for the upper flange.}$$

Another way of throwing the great body of the material at a distance from the neutral axis is, to make it into the shape of a tube or hollow cylinder. Let B be the section of a hollow cylinder, the thickness of whose walls is represented by the shaded ring; and A be the section of a solid cylinder of the same material. If the area of A is equal to that of the ring in B, the two cylinders will contain the same quantity of matter, but B will be stronger than A, nearly in proportion as cg is longer than dg.

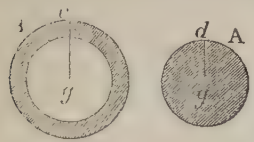


Fig. 6.

The principle of hollow structure prevails both in nature and art, wherever strength and lightness have to be combined. It is seen in the stems of plants, especially of the grasses; the bones of animals are also hollow, and those of birds, where great lightness is required, are most so. A feather, with its hollow stem, is perhaps the best instance of the union of strength and lightness that could be given. In art, again, we have hollow metal pillars; and sheet-iron for roofing and other purposes is *corrugated*, or bent into ridges and furrows, to give it depth. Each ridge or furrow is, as it were, half a tube, and resists bending with twice or thrice the energy it would if flat.

The most striking application of the principle of hollow structure is seen in tubular bridges. Fig. 7 represents a section of the tube of the Conway Bridge. The object being to resist a vertical strain, the form is made rectangular, and the chief mass of the material is thrown into the top and bottom. The tube may, in fact, be considered as an immense beam or girder constructed on the principle of fig. 5, the top and bottom being the two flanges, and the two sides serving to connect them, instead of the one rib in the middle. As it is constructed of plate-iron, the top requires more metal than the bottom, in order to resist the compression; but instead of putting the metal into one thick plate, or into several plates laid the one on the other, it is made to form a set of minor tubes or cells, which give additional stiffness and strength to the whole tube. The floor, in like manner, contains cells. Each of the tubes over the Conway is 24 feet high, 14 feet wide (outside), and 420 feet long, and weighs 1300 tons; yet these enormous hollow beams sustain not only their own weight, but the heaviest railway-trains without sensible deflection.


Fig. 7.

Fig. 8 represents an ingenious contrivance for strengthening the wooden beams supporting a bridge. An iron rod, fixed to the beam AB at the two ends, is kept at a distance by struts c, c'. The beam cannot now be bent downwards without stretching the rod; which thus has to bear the tensive strain, while the beam itself sustains only the compressive strain.

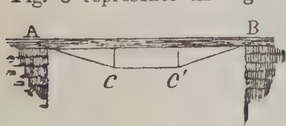


Fig. 8.

Another way of removing part of the strain from a girder, is to fix a king-post, c, and two oblique pieces on its upper side, as in fig. 9. The whole is now one composite girder; and when any weight, f, bears upon it, the whole of the compressive strain is thrown upon the pieces a, b, and only the tensive strain is left for the beam to sustain.

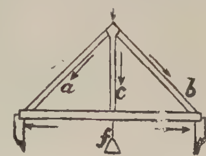


Fig. 9.

When a beam AB is fixed at one end, and loaded at the other, the strain is greatest at B, and is less at other points, as c, c', in proportion as Ac, Ac', the levers at which it acts, are less than AB. The beam may therefore be made to taper off towards the end, and we may determine the exact form the beam should have, in order to be equally strong at every point. For supposing the breadth uniform, the strength increases as the squares of the depths $c'd'$, cd, while the strain increases as the levers Ac', Ac; and thus, if $Ac : Ac' :: cd^2$ to $c'd'^2$, the strengths are equal at those points. This proportion will always hold good, if the curve of the beam is that of a parabola; and, accordingly, this is the shape given to the beams of steam-engines.

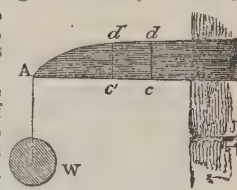


Fig. 10.

In beams supported at both ends, the strain is greatest in the middle; girders are therefore made strongest in the middle, and taper towards the ends.

4. *Shearing Strain.*—This force is called into play when a plate is cut by shears, or when a riveted or bolted joint is torn asunder, in which case the rivets are sheared across. The effect of it is to cause the particles in one plane to slide over those in another; this is resisted by their mutual coherence, and the magnitude of the resistance depends on the number of the particles, that is, on the area of cross section of the body sheared. The following laws are the result of experiment—1. The ultimate resistance to shearing is proportional to the area of section of the bar sheared. 2. The ultimate resistance of any bar to a shearing strain is nearly the same as the ultimate resistance of the same bar to a direct longitudinal strain.

5. *Torsion.*—If one end of the axle or shaft of a wheel is immovably fixed, and a power acts at the circumference of the wheel (or at the end of a lever or winch), the power may be so increased as to twist the shaft asunder at its weakest point. If a shaft A has twice the diameter of another shaft B, there will be four times as many fibres in the section of fracture of A, to resist the twist, as in that of B. But as the separation takes place by the one end of the fracture turning round upon the axis of the shaft, making the ends of the separating fibres describe circles, those fibres that are furthest from the centre will have the greatest power of resistance, and the sum of their moments, of their united effect, will be in proportion to their mean distance from the centre. This mean distance in A is twice that in B; therefore, the resistance in A is 2×4, or 8 times the resistance in B. Generally, *the strength of shafts to resist torsion is as the cubes of their diameters.* The torsive strengths of shafts 1 inch diameter, and with weights acting at 1 foot leverage, being found by experiment for different materials; the strength of shafts of other dimensions is found

from these 'constants' by multiplying by the cube of the diameter, and dividing by the length of the lever. It is evident that the torsive strength of a hollow shaft will be greater than that of a solid one of the same quantity of material, on the same principle that its transverse strength is greater. The rule used by Boulton and Watt for calculating the diameters of their wrought-iron shafts was as follows :

$$\text{Diameter of shaft in inch.} = \sqrt[3]{\frac{120 \times \text{horse-power.}}{\text{Revolu. per minute.}}}$$

This is found to make the shafts rather too light; and the following variation gives safer practical results :

$$\text{Diameter of shaft in inch.} = \sqrt[3]{\frac{240 \times \text{horse-power.}}{\text{Revolu. per minute.}}}$$

STREPSI'PTERA (Gr. twisted-wings), an order of insects called RHIPIPTERA (Gr. fan-winged) by Latreille, but first established by Kirby. The first-known species were observed by Rossi, and referred by him to the order *Hymenoptera*. The order S. consists of a small number of species, very singular in structure and habits, apparently forming an aberrant division of the *Coleoptera*, most nearly allied to the *Meloidæ*. The species are all small, and in their larval state live parasitically in the bodies of bees and wasps. Their natural history has been the subject of much attention since they were discovered; but much still remains obscure. The species form the two genera *Stylops* and *Xenos*.

STRE'TCHING-COURSE, in Masonry or Brickwork, is a course in which the stones or bricks are placed with their longest sides along the face of the wall. The stones are called *stretchers*, as those placed at right angles to them with their end exposed are called *headers*.

STRE'TTO (Ital. bound), in Music, a term which signifies that the movement to which it is prefixed is to be performed with rapidity gradually accelerating towards the close.—The term *stretto* is also applied to the recurrence in a fugue of the subject in one part before it has come to a close in another. See FUGUE.

STRI'Æ, the fillets between the flutes of columns, pilasters, &c.

STRICKLAND, AGNES, an English authoress, the daughter of Thomas Strickland, Esq., was born at her father's seat, Reydon Hall, near Southwold, in Suffolk, in the year 1806. She was the third daughter of a family of six daughters and two sons, nearly all of whom have contributed something to the literature of our time. Her first compositions were mostly in the poetical vein, and consisted of anonymous contributions to periodicals. About the year 1825, however, she published, in conjunction with her sister Susanna (afterwards Mrs Moodie), a volume of *Patriotic Songs;* which was followed, in 1826, by a little volume bearing her own name exclusively, and entitled *Worcester Field, or the Cavalier; a Poem, in Four Cantos, with Historical Notes*, which was favourably received by some of the reviews. *Worcester Field* was followed by *The Seven Ages of Woman, and other Poems* (Lond. 1827); and this by *Demetrius, a Tale of Greece, in Three Cantos* (Lond. 1833), written in the metre of Byron's *Corsair*. In 1836, she published a little volume entitled *Floral Sketches, Fables, and other Poems;* republished in 1861. With this the list of Miss A. S.'s poetical works ends. Among her prose works are : *The Rival Crusoes*, published without date ; *The Pilgrims of Walsingham, or Tales of the Middle Ages, an Historical Romance* (2 vols., 1835) ; *Tales and Stories from History* (1836) ; *Alda, the British Captive* (1841) ; *Historical Tales of Illustrious British Children* (1847 ; new ed. 1858) ; *Historic Scenes and Poetic Fancies* (1850) ; *Old Friends and New Acquaintances* (2 series, 1860—1861). All these, however, are but of small import in comparison with her well-known work, *Lives of the Queens of England from the Norman Conquest, with Anecdotes of their Courts*, in 12 vols. (Lond. 1840—1848 ; new ed., 8 vols., 1851—1852). In this work, the materials for which she discovered by diligently ransacking among the treasures of the British Museum and other great public repositories of historic documents, Miss S. was largely assisted by her sister Elizabeth, an assistance which she gratefully acknowledges in her Preface. It was dedicated to Queen Victoria; and as each volume successively appeared, its picturesque style and anecdotical character made it a general favourite, especially among that class of readers whose object in reading history is rather amusement than philosophical instruction. At the same time, it must be owned that in these *Lives* she has added materially to our stock of historical information. Miss S.'s *Lives of the Queens of England*, concluding with the biography of Queen Anne, were followed by the *Lives of the Queens of Scotland and English Princesses connected with the Regal Succession of Great Britain*, in 8 vols. (Edin. and Lond. 1850—1859) ; and these by her *Lives of the Bachelor Kings of England* (Lond. 1861), and *Lives of the Tudor Princesses, including Lady Jane Grey and her Sisters* (Dec. 1868). In 1865 she published a novel, entitled *How will it End?* and in 1866 *Lives of the Seven Bishops.* In 1871 she received a pension of £100. She died July 13, 1874.

STRI'CTURE is a term employed in Surgery to denote an unnatural contraction, either congenital or acquired, of a mucous canal, such as the urethra, œsophagus, or intestine. When, however, the affected part is not mentioned, and a person is stated to suffer from stricture, it is always the urethral canal that is referred to. Contraction of this canal may be either permanent or transitory; the former is due to a thickening of the walls of the urethra, in consequence of organic deposit, and is hence termed organic stricture; while the latter may be due either to local inflammation or congestion, or to abnormal muscular action: the first of these varieties may be termed inflammatory or congestive stricture; and the second, spasmodic stricture. The last-named form seldom exists except as a complication of the other kinds of stricture. There are two principal causes of organic stricture—the first being inflammation of the canal, and the second injury by violence. Inflammation is by far the most common cause, and gonorrhœa is the common agent by which it is excited. Not unfrequently, stimulating injections thrown into the urethra, with the view of checking the gonorrhœal discharge, excite an inflammatory action, which gives rise to stricture. Fortunately, it is only in exceptional cases that a stricture results from inflammation of the urethra, the inflammation, in the great majority of cases, terminating by resolution, and leaving the canal as healthy as before the attack. It is when the complaint assumes a chronic character that it most commonly lays the foundation of stricture. Stricture from the second cause arises from such cases as falling across spars, scaffolding, ladders, &c., or on some sharp object which punctures the perinæum, as from earthenware vessels which break under the sitter.

The earlier symptoms of stricture are a slight urethral discharge and pain in the canal, behind the seat of the stricture, at the time of micturition. The stream of urine does not pass in its ordinary

form, but is flattened or twisted; and as the disease advances, it becomes smaller, and ultimately the fluid may only be discharged in drops. The straining efforts to discharge the urine often induce Tenesmus (q. v.).

As the case advances, the urine becomes alkaline and ropy, and deposits a precipitate when allowed to stand; and attacks of complete Retention (q. v.) occur with increasing frequency. But these symptoms are not in themselves sufficient to establish the presence of stricture. It is necessary to examine the urethral canal with a Catheter (q. v.) or Bougie (q. v.), to ascertain whether an organic obstruction exists, whether one or more strictures are present (as many as eight have been recorded, although four are rare; and one is the most common number), and their calibre. The treatment of organic stricture is too purely surgical to be discussed in these pages: it is sufficient to state that its object is twofold, viz., first, to restore the natural calibre of the canal, so far as this can be safely effected; and secondly, to maintain this patency, after it has been established.

Spasmodic stricture may occur from any of the following causes: the presence of organic stricture or of inflammation of the mucous membrane; from an acrid condition of the urine; from the administration of cantharides, turpentine, &c.; and from the voluntary retention of urine for too long a time. The treatment consists in the removal of the causes as far as possible, and the hot bath. The inhalation of chloroform sometimes gives immediate relief; and several cases are recorded in which, when the spasm occurred periodically, it was cured by quinine. Inflammatory or congestive stricture commonly arises when a recent purulent discharge from the urethra has been checked by external cold or wet. The patient complains of heat, fulness, and soreness in the perinæum; the passage of the urine is extremely painful, the stream being small, and ceasing before the bladder empties. The treatment is much the same as that for Retention of Urine (q. v.).

STRIE′GAU, a walled town of Prussia, province of Silesia, and government of Breslau, is situated on Striegau Water, 32 miles west-south-west of Breslau. It has manufactures of woollens and linens. Pop. (1867) 8561.

STRIKE, a term borrowed by geologists from the German *streichen*, to extend, and adopted with the technical meaning it has in that language. It is applied to the direction of the outcrop of a stratum —the line which it makes when it appears on the surface of the earth. This line is always at right angles to the dip of the bed. The angle of dip and the direction of strike are determined by a clinometer and compass. A perfectly horizontal stratum can have neither dip nor strike.

STRIKES. See COMBINATION.

STRING-COURSE, a thin projecting course of stone or brickwork in a wall, generally ornamented with a moulding, and made to go round windows or other openings in the wall.

STRINGE′NDO, a term used in Music to denote a gradual acceleration in the time.

STRI′NGHALT is a peculiar catching up of the horse's limbs, usually of one or both hind limbs. It is most noticeable when the animal is first brought out of the stable, when he is excited, or made to turn suddenly round; it is a variety of chorea or St Vitus's dance. Although a serious eyesore, it does not interfere with usefulness, but is quite incurable.

STRO′BILA. See TAPE-WORMS.

STRO′MBIDÆ, a family of gasteropodous molluscs, of the order *Pectinibranchiata*, nearly allied to *Buccinidæ* (Whelks, &c.) and *Muricidæ*. The shell has a canal, the external lip of which, as it attains maturity, becomes more or less dilated, and is marked with a sinus, whence the head issues when the animal comes out. The foot is narrow and small, but is employed in active leaping movements, during which the shell oscillates from side to side. The species are numerous, and are mostly inhabitants of tropical seas. Some of them are among the largest of molluscs. *Strombus gigas* is the largest known univalve. It is found in the West Indies, on reefs in shallow water, and is fished both

Fountain-shell (*Strombus gigas*).

for the table and on account of the shell. Great numbers of the shells are imported into Britain; 300,000 have been brought to Liverpool in a year. They are sometimes called Fountain-shell, from their occasional use as a garden ornament. Their chief use, however, is by cameo-makers, by whom they are valued for their solid and delicately tinted substance. A shell sometimes weighs four or five pounds. Pearls of a delicate pink colour are sometimes found in this shell. The *Strombi* are sometimes called wing-shells, from the dilated margin of the lip.

STRO′MBOLI, one of the group of the Lipari Islands (q. v.), the most north-easterly of the group, is about 12 miles in circumference, circular in shape, and contains 1452 inhabitants. It is wholly of volcanic formation, and rises to the height of 3100 feet above sea-level. On its western side is a volcano of considerable activity. Sulphur and pumice-stone are gathered in large quantities, and among the chief agricultural products are cotton, wine, and excellent fruits.

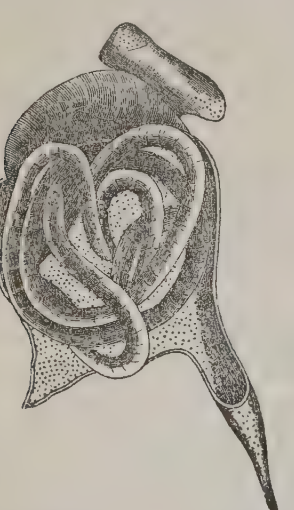
STRO′MNESS. See ORKNEY ISLANDS.

STRONGY′LIDÆ, a family of nematode worms, possessing the following common characters. The body is round, and sometimes very much elongated, and almost thread-like. The mouth is round, oval, or triangular, and situated at the extreme anterior end of the body. The tail of the male is commonly furnished with a bursa, usually emitting two spicules. The whole family is parasitic, and contains a number of genera. Some of the S. are parasitic in man, some in mammals, birds, reptiles, &c.

STRO′NGYLUS (from the similar Greek word signifying *round*) is the term applied to a genus of the family *Strongylidæ* (q. v.) of nematode parasitic worms. The only true S. infesting man is the *S. bronchialis* of Cobbold, previously known as *Filaria hominis bronchialis*, *Hamularia compressa*, &c. The male usually measures rather more than half an inch, while the female is upwards of an inch in length. For the general and specific characters of this rare entozoon, the reader is referred to Cobbold's *Entozoa*, p. 357. The worm was originally discovered by Treutter in 1790, who found severa

individuals in the bronchial glands of an emaciated subject. In 1845 it was again found by Dr Fortsitz at Klausenberg in Transylvania, in the lungs of a boy six years old. These are the only two cases recorded by Küchenmeister and Cobbold of its occurring in the human subject; but closely-allied species, *S. paradoxus* and *S. micrurus*, are occasionally found, according to Cobbold, in the lungs and air-passages of the pig and the calf respectively, and Küchenmeister states that he has found a species in the lungs of the sheep.

Closely allied to S. is the genus *Eustrongylus* of Diesing and Cobbold, which contains the species *E. gigas*, more commonly known as the *Strongylus gigas* of Rudolphe, Cuvier, and others. This is the largest nematode worm at present known to infest man or any other animal; 'the male measuring from ten inches to a foot in length, and ¼th of an inch in breadth; whilst the female is said to attain a length of over three feet, its transverse diameter being fully half an inch; body cylindrical, and more or less tinged with redness; head obtuse, and furnished with a simple oval aperture surrounded by six chitinous nodules: mode of reproduction, probably viviparous; eggs broadly oval, measuring about $\frac{1}{300}''$ from pole to pole.'—*Op. cit.*, p. 358. This worm occurs, according to Bremser, in the kidneys and bladder, sometimes in the abdominal cavity and the omentum, more rarely in the lungs and liver of 'martens, dogs, wolves, seals, otters, oxen, and horses.' Fortunately, it is very rare in man, and, according to Cobbold, weasels are the animals in which it is most commonly found. The accompanying figure shews one of these worms coiled up



Strongylus gigas.—From Cobbold's *Entozoa*.

within the pelvic cavity of the kidney of the coati, a species of monkey. The symptoms to which it must give rise must be much the same as those arising from abscess and degeneration of one of the kidneys, or from renal calculi. The diagnosis in a suspected case could only be established by the detection of the eggs or embryos in the urine

STRO'NSAY, one of the Orkney Islands, lies 15 miles north-east from the town of Kirkwall. It is 7½ miles long, and 6 miles in extreme breadth. Pop. about 1500.

STRONTIA. See STRONTIUM.

STRO'NTIUM (symb. Sr, equiv. 87.5, sp. gr. 2·54) is a ductile and malleable metal somewhat harder than lead, and of a pale yellow colour. When heated in the air, it burns with a crimson flame, and becomes converted into its oxide, strontia. It is unaffected by the action of dry air, but it decomposes water at an ordinary temperature, hydrogen being explosively developed; and it burns in chlorine gas, and in the vapour of iodine, bromine, and sulphur. It dissolves in dilute nitric acid, but the strong acid has scarcely any effect on it. This metal does not occur in the native state, but exists as a carbonate in the mineral *Strontianite* (so called from its being first found near Strontian, in Argyleshire), and as a sulphate in the mineral known as *Celestine* (so called from its delicate blue tint). It is obtained by the voltaic decomposition of the chloride of strontium. This metal bears to barium the same close relation that sodium bears to potassium; and the compounds of S. resemble those of barium not only in their composition but in their properties.

The oxide of S., commonly known as STRONTIA, is obtained in the same way, and resembles in almost all respects the corresponding oxide of barium, except that it is inert when taken into the system, while baryta is poisonous. When a small quantity of water is poured upon it, it slakes, giving out heat.

The salts of strontia resemble those of baryta in their general characters, and in their being precipitated from their solutions by sulphuric acid and the soluble sulphates; but they differ from them in not being thrown down by silico-fluoric acid or hyposulphite of soda, and in their communicating to the flame of the spirit-lamp and to burning substances generally, a brilliant purple-red colour. The salts of strontia occur only in the mineral kingdom, and are never found as normal ingredients of organic bodies. *Carbonate of Strontium* (Sr_2CO_3) occurs native both in a massive and crystalline form, and may be obtained artificially as a white powder by precipitating a soluble salt of S. with carbonate of sodium. *Sulphate of Strontium* occurs native in *Celestine*, a mineral which is found in beautiful rhombic prisms in Sicily. *Nitrate of Strontium* (Sr,NO_3) separates from a hot concentrated solution in large colourless transparent anhydrous octahedral crystals, which dissolve freely in water. By the addition of nitric acid, it is precipitated from its aqueous solution. This salt is insoluble in alcohol; but when finely powdered, and mixed with it, it communicates to the alcoholic flame a beautiful red or crimson colour. In consequence of this property, it is employed by the makers of fireworks. A mixture of 40 parts of nitrate of strontium with 10 of chlorate of potash, 13 of sulphur, and 4 of sulphide of antimony, deflagrates with a magnificent red colour, and constitutes what is popularly known as *Red Bengal Fire;* but the mixture is dangerous both to prepare and to preserve, having more than once been the occasion of frightful accidents to the manufacturers from its becoming ignited spontaneously.

The most important of the haloid salts of S. is the *Chloride* ($SrCl$), which may be obtained in crystals containing six equivalents of water. The water is expelled at a moderate heat, leaving the chloride anhydrous. The chloride is the only salt from which the metal has hitherto been obtained.

Regarding the history of this metal, it may be observed that strontia was discovered as an independent substances almost simultaneously by Hope and Klaproth in 1793. In 1807, Davy obtained barium and strontium from their oxides, but not in a pure state; and it was not till 1855 that Bunsen and Matthiessen succeeded in procuring perfectly pure specimens of the metal.

STRO'PHULUS. See RED GUM.

STROUD, a parliamentary borough and market-town of Gloucestershire, nine miles south-south-east of the city of Gloucester, stands in a beautiful and extensive valley, at the confluence of the Frome and Slade, which unite to form the Stroudwater or Frome. It is the centre of the woollen manufactures of Gloucestershire, and contains a number of woollen and silk mills. The water of the Frome is peculiarly adapted for use in dyeing scarlet and other grain colours; and on this account, cloth-factories and dyeworks have been built along its banks for the distance of 20 miles. The borough of S. forms part of the great west of England cloth districts. Pop. of parliamentary borough, which sends two members to the House of Commons (1871), 38,602; (1881) 40,573.

STRUENSEE, Johann Friedrich, Count of, a man who, in last century, attracted the attention and excited the sympathy of the whole of Europe, by his elevation and downfall at the Danish court. S. was born 5th August 1737, at Halle on the Salle, where his father, Adam Struensee, the author of the old Halle Hymn-book, was pastor of the Ulrichskirche. Young S. studied medicine, and when scarcely 19 years old passed as Doctor. Early alienated from positive Christianity, he zealously embraced the philosophy which had then arisen in France, and became a disciple of Helvetius and Voltaire. When his father removed to Altona, he accompanied him, and was soon afterwards appointed travelling physician to the young king, Christian VII. of Denmark; and on their return from a tour, physician in ordinary. At first, the young queen, Caroline Matilda, sister of George III. of England, looked upon him with mistrust; and it was not till 1770, when S. successfully managed the inoculation of the two-year old crown-prince, afterwards King Frederick VI., that she came round to him, intrusted him with the education of the prince, and by degrees made him the confidant of her unhappy position. S. removed the estrangement between the royal pair, which was the work of the favourite Holck, and, in consequence, rose still higher in favour with both. He was appointed Reader to the king, and Private Secretary to the queen. Since the revolution of 1660, Denmark had been under the domination of the nobility, who, as a council of state, governed the country. S. saw the disadvantages of this government of the nobles, and formed the ambitious resolve to come forward in this land of his adoption as an enlightened reformer after the model of Frederick II. To begin with, he effected the downfall of the favourite Holck, in whose stead his friend Brandt was appointed Royal Companion and Director of the Court Amusements. In order to gain the love of the people, S. proclaimed the freedom of the press. The council was dissolved, and a proclamation issued to the effect that the royal power in all its purity, as it had been handed down from olden times, was to be re-established. These measures amounted in reality to a revolution, and to a declaration of war against the aristocracy. The queen and S., in whose hands the whole power now was, chose new ministers, and excluded the feeble Christian entirely from the management of affairs. In July 1771, S. received the title of Cabinet Minister, along with unlimited power. He brought several men from Germany, whom he appointed to different offices. This introduction of strangers caused great dissatisfaction among the people. In opposition to the politics of his predecessors, S. endeavoured to free Denmark from Russian influence, and to find a natural ally in Sweden. The changes which he undertook in the internal affairs were directed to the advancement of the prosperity of the country, of civil liberty, and enlightenment. He put the finances in order, reduced the expenditure, loosened the fetters in which industry and trade had been bound, encouraged education, mitigated the penal laws, and brought order into the administration. An act passed in 1771, to a certain extent abolished serfage. All these reforms, which are in operation in the Danish dominions at the present day, were excellent; but the haste and want of statesmanlike skill with which they were carried out, made them appear as the acts of the most vexatious tyranny. S. committed a great mistake, too, in recklessly obtruding his philosophy of enlightenment in the face of the strict orthodox clergy and the pious prejudices of the people.

S. had scarcely been in power a year when the symptoms of reaction appeared in all quarters. The queen gave birth to a daughter in 1771, which, in the condition of the king, gave rise to most scandalous reports. The British ambassador, Lord Keith, who saw the catastrophe approaching, proposed to S., by the advice of George III., to take refuge in England; but S. declined doing so. At the head of the hostile party was Christian VII.'s stepmother, Juliana Maria, Princess of Braunschweig-Wolfenbüttel, who was impatient of the domination of the queen and Struensee. A bold stroke was to precipitate S. and ruin the queen, and the night when a court-ball was to take place was fixed upon for carrying out the plot. The conspirators assembled at the king's stepmother's, and by a secret door entered the bedroom of the king, and obliged him to make out 15 warrants of arrest, among others for Struensee. Christian was prevailed upon, but with much difficulty, to write out orders to arrest and convey his consort the queen to Kronenburg. S. and the queen were then taken prisoners, and the former was treated with extreme harshness, put in chains, and brought to the citadel. He was accused of an assault on the person of the king; of the intention to compel Christian to abdicate the throne; of criminal intercourse with the queen; of using a fatal system in the education of the crown-prince; and of the usurpation and abuse of supreme power. Not one of these points could be legally proved. In a second examination, however, S., with tears, confessed to having had improper intercourse with the queen; but some of his contemporaries affirm that he made the confession under threat of torture. On this important confession, a second commission was sent to the queen at Kronenburg, from whom, however, not the slightest confession of guilt could be extorted. When one of the commissioners at last remarked that if she made S. guilty of falsehood, he would be put to a disgraceful death for slandering majesty, the queen seized a pen, and began to sign a paper which contained the confession of her guilt. She had not finished when she sunk in a swoon in her chair; and it is said that some one put the pen in her hand, and guiding it, finished the name, 'Caroline Matilda.' S. was found guilty of a great and capital crime, and was sentenced to a cruel death. It was wished by some to proceed further against the queen; but the commissioners were satisfied with the simple separation of the royal pair, especially as the British ambassador threatened the appearance of a British fleet. After the king had confirmed the sentence, not without being urged by the Russian ambassador, it was carried into execution on the 28th April 1772, amid the rejoicings of the multitude. In the prospect of death, S. is said to have returned to the Christian faith. There is no doubt that he did not deserve his fate, but that he fell a sacrifice to the party of the nobles. The execution of his friend Brandt, which took place at the

same time, was a still clearer case of legal murder, as he never took any part in the affairs of government. S.'s brother would have shared the same fate, had not Frederick II. claimed him in a menacing manner as a Prussian subject. Queen Caroline Matilda left Denmark in May 1772, and died of grief in 1775, in the castle of Celle in Hanover.

In recent times, S.'s history has been recalled to memory in a tragedy by Mich. Beer and Heinr. Laube. See Höst, *Count Struensee and his Ministry* (1824; Germ. Copenh. 1826); Falkenkeöld, *Mémoires* (Paris, 1826).

STRUTS, straining pieces of timber in a roof, used to strengthen the principal Trusses (q. v.).

STRUVE, Friedrich-Georg-Wilhelm, a celebrated astronomer, was born at Altona, April 15, 1793, educated at the university of Dorpat (Russia), and appointed to a post in the observatory of that place in 1813. He became Director of the Dorpat Observatory in 1817, and continued with the utmost assiduity his observations and researches respecting double and multiple stars, adding immensely to our knowledge of these systems, and earning for himself the reputation of being one of the most skilful of practical astronomers. The instrument with which he observed was a Fraunhofer's (q. v.) refractor, of 10 inches aperture, and 13½ feet focal length; and with this telescope, in gleaning from the depths of space the materials for his three important works on double stars (1822 and 1828, 1837 and 1840, 1852), he examined no fewer than 120,000 of these twinkling luminaries. His investigations have led him to the conclusion, that the number of true double stars is much larger than was previously supposed (see Stars). S. also executed a number of important geodetic operations, such as the triangulation of Livonia, in 1816—1819, and the measurement of an arc of the meridian in the Baltic Provinces, in 1822—1827; which was subsequently (1828—1856) extended by him, in conjunction with Hansteen (q. v.) and Selander, to the North Cape; and by General Tenner southwards to Ismail in Turkey. This latter undertaking, the most extensive trigonometrical operation ever performed, when completed, gave the length of a meridian arc of 20°, and enabled geometers to determine with increased accuracy the exact form of the earth. Meanwhile, S. had been appointed, in 1839, director of the best organised observatory in the world, that of Pulkova (q. v.), and also chosen *correspondant* in the astronomical section of the Academy of Sciences of Paris. He died at St Petersburg, 23d November 1864.—His son, Otto-Wilhelm Struve, also an eminent astronomer, was born at Dorpat, May 7, 1819, was educated under his father's direction, became his chief assistant at Pulkova, and the Director of the observatory after his death. He has made numerous astronomical discoveries, among which are more than 500 new double stars, and (1847) a satellite of Uranus, and has written numerous important papers, the most noticeable of which set forth his researches on the inner or dusky ring and on the variation in breadth of the bright rings of Saturn, and on the periodic motions of double stars.

STRY'CHNIA, or STRY'CHNINE. See Nux Vomica.

STRY'CHNOS, a genus of trees of the natural order *Loganiaceæ*, having a five-lobed calyx, a tubular funnel-shaped or salver-shaped corolla, with a five-partite limb, five stamens, a filiform style, numerous ovules, and a one-celled berry, with a leathery rind, many-seeded, or, by abortion, one-seeded, the seeds discoidal and compressed. To this genus belongs the *S. nux vomica*, a tree of middling size, with ovate stalked leaves, a native of India, the fruit of which is produced in great abundance, and is about the size of a small orange; the seeds are the *Nux Vomica* of commerce, and yield *Strychnine.* The bark partakes of the poisonous quality of the seeds. The wood of the tree is very hard and durable. The Clearing-nut (q. v.) and St Ignatius' (q. v.) Bean are produced by species of this genus, to which also belongs the tree (*S. toxifera*) which produces the Woorali or Curare (q. v.) poison of South America. Another species is the Upas Tieuté (*S. Tieute*) of Java, a large climbing shrub, the bark of which is extremely poisonous, containing a very large quantity of strychnine. The wood of a species found in the north of India (*S. colubrina*), which is also a climber, is an imaginary cure for snake-bites. The bark of *S. pseudo-quina*, a Brazilian species, is used as a substitute for cinchona.

STRYPE, Rev. John, a voluminous ecclesiastical historian, was born in London in 1643. He studied at Cambridge, entered the church, and held for many years, with other smaller livings, the rectory of Low Leyton, in Essex. He died at Hackney in 1737, having reached the great age of 94. His works fill thirteen large folio volumes. The most important are—*Memorials of Archbishop Cranmer* (1694); *Life of Sir Thomas Smith, Secretary of State to Edward VI. and Elizabeth* (1698); Lives of *Bishop Aylmer* (1701), *Sir John Cheke* (1705), *Archbishop Grindal* (1710), *Archbishop Parker* (1711), and *Archbishop Whitgift* (1718); *Annals of the Reformation* (vol. i. 1709, vol. ii. 1723, vol. iii. 1728, and vol. iv. 1731); *Ecclesiastical Memorials*, relating to religion and the Church of England under Henry VIII., Edward VI., and Queen Mary, in 3 vols. folio, published in 1721. This is his best work, forming, with Burnet's more readable *History of the Reformation*, a consecutive and full account of the reformed Anglican Church. S. also published an enlarged edition of Stow's *Survey of London*, with several sermons and pamphlets. As a writer, he is heavy, but honest and plodding, and he was a faithful transcriber of the ancient papers he published, which, he says, were all copied with his own hand.

STUART, Charles Edward Lewis Casimir, often called the younger Pretender, the eldest son of James Francis Edward, Prince of Wales, known as the elder Pretender, or Chevalier St George (see Stewart, Family of), and his wife Clementina Sobieski, grand-daughter of the celebrated Polish monarch, John Sobieski. He was born at Rome, on the 31st December 1720, and bore among the Jacobites the title of Prince of Wales. He served under Don Carlos in Spain, and in his youth is described as having been handsome, affable, and engaging in manners. In 1743, 28 years after his father's unsuccessful attempt to regain the crown, a scheme was contrived in France, with the support of the Jacobites in England, by which Charles Edward was to recover the throne of Great Britain for his family. The first contrived project was to land an army in Kent, where were many adherents of the exiled House; and troops to the number of 15,000 were assembled, and transports provided at Boulogne, Dunkirk, and Calais to carry them to England. But the squadron which was to have convoyed the transports fled before the British fleet under Sir John Norris; a storm destroyed the transports, and most of the troops were drowned. Charles, however, only awaited a favourable opportunity to make a fresh attempt. In July 1745, when George II. was in Hanover, and Scotland almost without military, he sailed from Nantes, in company with the Marquis of Tullibardine, and

a few other devoted followers, and landed in the bay of Lochnanuagh, whence he proceeded to Kinlochmoidart, where the Highland clans attached to his cause were summoned to rise. Ten days later, Charles's standard was set up at Glenfinnan; and he marched southwards at the head of a large body of hardy mountaineers. Government offered a reward of £30,000 for the apprehension of the Pretender's son, who retaliated by offering a like reward for the apprehension of the Elector of Hanover. At Perth, the insurgents were joined by the Duke of Perth and Lord Strathallan, with a numerous retinue of followers; and on their approach, Edinburgh surrendered without resistance, the castle, which was in possession of the king's troops, still holding out. Charles took up his residence at Holyrood Palace, where he proclaimed his father king of Great Britain, and himself regent.

Meanwhile, Sir John Cope, the commander-in-chief of the king's troops in Scotland, having collected some reinforcements in the north, came from Aberdeen to Dunbar by sea, and encamped at Prestonpans. He was there unexpectedly attacked by the Highlanders, and ignominiously routed, leaving baggage, cannon, and camp equipage on the field. Contrary to the advice of his council, Charles, who could not bear opposition, resolved to advance into England, though his force hardly exceeded 6500 men. Carlisle surrendered at his approach, and he proceeded unmolested as far as Derby. In the meantime, three English armies, each larger than his own, were preparing to meet him. Being unable to raise any recruits in England, he found it necessary to retreat into Scotland, where he hoped to meet a reinforcement under Lord John Drummond. On their way north, the Highlanders were pursued by the Duke of Cumberland, whom they defeated near Penrith. Finding that Edinburgh was now in possession of the king's troops, Charles, joined by Lord John Drummond and Lord Strathallan, made his way to Stirling. That town surrendered to him, and he laid siege to the castle. General Hawley, in endeavouring to raise the siege, was utterly routed by Lord George Murray, at the head of the Macdonalds of Keppoch. But the advance of the Duke of Cumberland obliged the rebels to retreat further north, and for a time they carried on a desultory war with the king's troops in the neighbourhood of Inverness. On 16th April 1746, the Duke of Cumberland encountered Charles's army on Culloden Moor, and opened a heavy cannonade on them. The Highlanders at first rushed boldly forwards; but on the advance of the royal infantry, they gave way; the battle soon became a rout, and the fugitives were pursued and slaughtered by the dragoons, who gave no quarter, and spread carnage and desolation over the country. The rebels lost that day at least 1000 men of the bravest and most devoted to the cause. Charles escaped to the Hebrides, hunted by the king's troops; disguised in female attire, he was conveyed to Skye in an open boat by Flora Macdonald, daughter of Macdonald of Milton. For months he wandered in concealment among the mountains of Skye and the mainland, where he had many hairbreadth escapes; and though his secret was known to hundreds of the poorest of the people, no one was tempted by the £30,000 reward to betray him. He eventually escaped to France, and no further attempts were made to reinstate the exiled family.

Charles Edward remained in France till the peace of Aix-la-Chapelle (1748). It was made a condition of that treaty that France should abandon the cause of the Stuarts; and Charles, refusing to quit France voluntarily, was conducted with a guard out of the kingdom, and retired to Rome.

He married, on 17th April 1772, Louisa Maximiliana de Stolberg-Guedern, daughter of Gustavus Adolphus, Prince of Stolberg-Guedern. The union did not prove a happy one, and the princess withdrew herself from him. See ALBANY, COUNTESS OF. In the latter years of his life, the prince was addicted to intoxication. When his claims ceased to be supported by any foreign power, he dropped the title of Prince of Wales, and assumed that of Count of Albany. He died at Rome, 31st January 1788, and was buried at Frascati. There was no issue of his marriage, but he left a natural daughter, on whom he bestowed the title of Duchess of Albany, and to whom he bequeathed considerable property.

Two brothers, generally known as John Sobieski Stuart and Charles Edward Stuart, endeavoured, some years ago, to persuade the world that they were legitimate grandsons of Charles Edward. In point of fact, they were sons of Captain Thomas Allen, R.N., and grandsons of Admiral John Carter Allen, who died in 1800. Their story, as set forth, with some slight mystifications, in a work called *Tales of the Century, or Sketches of the Romance of History between the years* 1746 *and* 1846, was to the effect that their father, in place of being Admiral Allen's son, was a son of Prince Charles and the Princess Louisa, whose birth was kept secret, from fear of the Hanoverian family, and who was intrusted to Admiral Allen, and passed off by him for his own son. This story was conclusively refuted in the *Quarterly Review* for June 1847.

STUART, GILBERT CHARLES, American painter, was born at Narraganset, Rhode Island, in 1756. In his boyhood, he accompanied a Scotch painter named Alexander to Edinburgh, with whom he studied his art; but his master dying, he worked his passage home, and began to paint portraits at Newport. In 1778, he made his way to London, where he led for two years a wild Bohemian life; but his talent was recognised by his countryman, Benjamin West, President of the Royal Academy, who took him into his family, and whose full-length portrait he painted for the National Gallery. In 1781, he opened his studio in London, and painted the portraits of his Majesty George III., H.R.H. the Prince of Wales, the Duke of Northumberland, Sir Joshua Reynolds, John Kemble, Colonel Barré, and many other celebrated characters. He also made a professional visit to Dublin, and in Paris painted a portrait of Louis XVI. In 1793, in the fulness of his powers and fame, he returned to America, and painted portraits of Washington, Jefferson, and many of the distinguished men of the period, and commenced a portrait of John Quincy Adams, which at his death was finished by Sully. He died at Boston, July 1828.

STUART, MOSES, American divine and author, was born at Wilton, Connecticut, March 26, 1780, and educated at Yale, where he remained for some time as a tutor. He began the study of law, but abandoned it for theology, was ordained as pastor of a Congregational church at New Haven in 1806; and in 1809, was appointed Professor of Sacred Literature at the Theological School at Andover a position he filled till 1848. During this period, in addition to his professorial duties, he wrote a *Grammar of the Hebrew Language*, without points; *Letters to the Rev. W. E. Channing; Hebrew Grammar*, with points (based on Gesenius); *Commentaries on the Epistle to the Hebrews*, and *the Epistle to the Romans;* on the Books of Ecclesiastes, *Proverbs*, *Daniel*, and the *Apocalypse; Hebrew Chrestomathy; Essay on the Liquor Traffic; Essay on Christian Baptism; Hints on the Prophecies; Conscience and the Constitution*—manifesting in all acuteness, vigour,

and versatility. He died at Andover, Massachusetts, January 4, 1852.

STU'CCO, a composition used for the finer parts of plaster-work, such as cornices, enrichments, &c. Gypsum (q. v.), or Plaster of Paris, is used for this purpose. A coarser kind of stucco is also used for making floors, and for plastering the exterior of buildings.

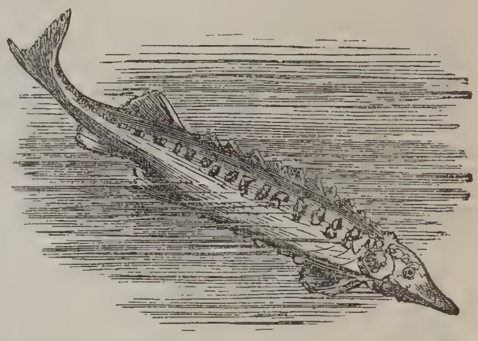
STUFFING, in Cookery, means force-meat used for filling the bodies of small animals, such as poultry, or for stuffing openings made for the purpose in large joints. It usually consists of bread-crumbs. savory herbs and other seasonings, minced very fine, and made into a paste.

STUHLWEI'SSENBURG (Hung. *Székes Fejérvár*, Slav. *Bielihrad* or *Bialigrad*, Lat. *Alba Regalis* or *Alba Regia*), a royal free town of Hungary, and seat of a bishop, lies in a swampy plain in the neighbourhood of the marshes of Sár-Rét, 16 miles north-east of Lake Balaton. The principal buildings are the splendid cathedral of the Virgin Mary, the church of St John, and the bishop's palace. It has several Catholic schools, a military academy, and a theatre. The inhabitants manufacture cotton cloths, flannels, leather, silk, and knives ('Stuhlweissenburg clasp-knives'), and extract soda from the swamps, which are, moreover, rich in fish, crabs, tortoises, and water-fowl. Pop. 19,000. S. is built on the site of the Roman *Floriana*, and from 1027 to 1527, was the place where the kings of Hungary were crowned and buried, 14 of whom repose here. In later times, it suffered much from the ravages of war, and was for some years in the hands of the Turks.

STÛPA. See TOPE.

STURDY, or the GID, affects sheep, and occasionally cattle, and is caused by the presence within the brain of a hydatid, reaching sometimes the size of a hazel-nut, and floating in a watery fluid enclosed in a membranous sac. This hydatid, when given to dogs, is known to produce tape-worms, and conversely itself originates from the ova of the tape-worm ejected on the pastures by dogs, rabbits, or even by sheep themselves. In the state of ova, or in some of its earlier minuter transitional forms, the hydatid embryo is picked up along with the grass, passes into the blood, and is thence laid down in the soft loose textures of the brain. It is most common in low damp pastures, and amongst sheep from six to twenty months old. The animal cannot properly seek its food, loses condition, staggers when moved, turns stupidly round almost in one spot, and usually towards the side on which the hydatid lies. The parasite and its sac may generally be safely removed by placing the sheep, with its feet tied, on a table or bench, searching for the softened portion of the skull, which generally overlies the hydatid, laying back a flap of skin, and introducing the trochar and canula, and when the sac is deep-seated, cautiously withdrawing it with the help of a small syringe. Protected by a leather cap and simple water-dressings, the wound speedily heals.

STU'RGEON (*Accipenser*), a Linnæan genus of cartilaginous fishes, now forming the family *Sturionidæ*, belonging to the *Chondrostean* division of the true fishes, or *Actinopteri*, being the nearest of that subclass to the *Crossopterygia*. The gills are free, as in the osseous fishes. The vertebral column is soft; and there are no evident sutures in the skull. Reproduction is by roe, as in osseous fishes. The form of sturgeons is elongated and angular; the plates are arranged in regular rows; the head is cuirassed; the snout long and conical; the mouth is on the under surface of the head, tubular, protractile, and without teeth. The upper lobe of the tail is much larger than the under. The dorsal and anal fins are opposite to one another, behind the ventrals. The air-bladder is very large, and communicates with the gullet by a large hole. The species of S. are numerous, and inhabit both the sea and fresh-water, ascending deep muddy rivers at certain seasons, and temporarily inhabiting lakes. Numerous species are found in the northern parts of the world, although there are none in the Arctic Ocean, or the rivers which flow into it, but the south of Siberia and North America particularly abound in them. They are plentiful in the Caspian and Black Seas, and in the rivers connected with them, where the S. fishery is of great importance, supplying the inhabitants of large districts with their chief article of subsistence, and producing great quantities of Caviare (q. v.), or preserved S. roe, and of isinglass (see GELATINE), for sale. The COMMON S. (*A. sturio*) is sometimes caught in the



Sturgeon (*Accipenser sturio*).

mouths of British rivers, most frequently in salmon-nets; and is a large fish, six or eight feet in length, with five rows of flattened plates; the muzzle long and pointed. Another species (*A. latirostris*), with broader muzzle, also visits the British coasts, but they are not popularly distinguished. The S. is more abundant on the northern coasts of Europe. It is also found in the more southern parts, and was in very high repute for the table among the Greeks and Romans. At their banquets, it was introduced with particular ceremonies. In England, when caught in the Thames, within the jurisdiction of the Lord Mayor of London, it is a *royal* fish, reserved for the sovereign. Its flesh is white, delicate, and firm. It is used both fresh, generally stewed, and pickled or salted.—The largest species of S. is the BIELAGA, or HUSO (*A. huso*), of the Black and Caspian Seas, and their rivers. It attains the length of 20 or 25 feet, and has been known to weigh nearly 3000 lbs. It enters the rivers in winter, while they are still covered with ice. Great part of the caviare of commerce is made from it, and much isinglass, which is merely the air-bladder washed, cut into strips, and dried. The STERLET (*A. Ruthenus*) is a comparatively small species, only about three feet in length, found in the same regions, and particularly esteemed for the delicacy of its flesh, and of the caviare obtained from it. There are several other European and Asiatic species; and some of the North American rivers and lakes abound at certain seasons in species of S. which are peculiar to them.—Sturgeons spawn in fresh water, but the young are seldom seen there and are supposed to descend very early to the sea.

STUTTGART, the royal residence and metropolis of Würtemberg, is beautifully situated in a widening of the Nesenbach valley, the hills forming a semicircle of eminences clothed with vineyards, orchards, and gardens. The basin in which S. nestles is 897 feet above the sea-level, and enjoys a mild and healthy climate.

Except the very oldest part of the city, the streets are broad, and the buildings handsome. The Schloss, or palace, is a fine modern building. The royal park and gardens extend from the north-east side of the palace for two miles in the direction of Carlstatt, have an area of 560 acres, are adorned by fine groups of trees, and intersected by shady avenues, in which all classes may freely walk. The cathedral, built in the 15th c., was gifted by the king, in 1852, with several beautiful painted windows. Other principal buildings are the Royal Theatre, public library, Mint, the royal stables for 300 horses, &c. A fine statue of Schiller has been erected in the palace plain. The private royal library, in the palace, contains 54,000 printed books and 800 MSS.; the public royal library 200,000 volumes, 3600 MSS., 120,000 smaller works, and a peculiar collection of 8700 Bibles in 80 languages.

S. has many benevolent institutions and societies. There is direct railway communication with the leading cities of Germany, Switzerland, France, Belgium, and the Netherlands. Pop. in 1855, 50,804; in 1861, 61,314; in 1871, 91,623, of whom 78,624 were Protestants and 10,708 Catholics; in 1880, 117,303. Since 1866 S. has increased rapidly. Principal industries are the manufacture of cotton and half-wool fabrics, iron and tin work, gold and silver articles, chemicals, tobacco, beer-brewing, &c. S. has a high position in the book-trade, and is the place of meeting of the Booksellers' Union of Southern Germany. The annual vintage of the district is valued at 200,000 florins, and the produce of the gardens and orchards at nearly double that amount. S. was the birthplace of Hegel; here, also, Schiller's youth was spent. The name of the city occurs for the first time in 1229. It was besieged by King Rudolph of Hapsburg, 1286—1287, and appears then to have been a place of strength. Between 1634—1638, nearly 9000 people died of the plague; and during the wars of Louis XIV., S. was thrice taken; and again in 1796, 1800, and 1801.

STYE, or STY, is the popular name for a minute boil occurring at the edge of the eyelid, and known to surgeons under the term *hordeolum*. It begins as a small, red, tense swelling, accompanied with considerable itching, and a feeling of stiffness. As the inflammation goes on, the lid may become so swollen as to keep the eye closed. In a few days, matter forms, a white point appears at the apex of the swelling; and when the cuticle gives way, pus and a small slough of connective tissue escape, after which there is a general remission of the symptoms, and the eyelid soon resumes its natural state.

This common affection is chiefly confined to scrofulous and delicate children, but it is sometimes observed in persons of more advanced age. The best local treatment consists in the application of warm-water dressings with lint and oiled silk; and if any hardness remains after the discharge of the matter, dilute nitrate of mercury ointment may be applied. The stye should never be rubbed (notwithstanding the common prejudice in favour of rubbing it with a gold ring), nor, in general, is it necessary to puncture it. To prevent the recurrence of these little boils, attention should be paid to the diet, which should be abundant and nourishing, to the state of the bowels, and to the general health, and tonics may usually be prescribed with advantage. The old form of the word was *stian*.—See Holland's *Plinie*, book xxviii. ch. xi.

STYLE, Old and New. See Calendar.

STYLI'TÉS. See Pillar Saints.

STY'LOBATE, the substructure of a temple beneath the columns. It is sometimes continuous all round the peristyle in the form of three high steps; sometimes it resembles a continuous pedestal along each side, with flights of steps at either end.

STY'PTICS (Gr. *styptikos*, astringent) are agents employed in Surgery for the purpose of checking the flow of blood by application to the bleeding orifice or surface. See Bleeding.

STY'RIA (Ger. *Steiermark*), a Cis-leithan province of the Austro-Hungarian monarchy, is bounded on the N. by Upper and Lower Austria, E. by Hungary and Croatia, S. and W. by Carniola, Carinthia, and Salzburg. Its area is 8671 English sq. m., and pop. (1880) 1,212,367, who are partly of German and partly of Slavic origin. S. is a mountainous country, being traversed in the west and centre by branches of the Noric Alps, which spread out into numerous ramifications; while the southern portion, between the Drave and the Save, is occupied by branches of the Carnic Alps. The climate of S., like that of most mountainous countries, is variable, but is generally raw and cold in the northern and more mountainous portion, and mild in the south. But in spite of its physical character, agriculture is so zealously prosecuted, that ⅘ths of the country are under cultivation, producing rye, wheat, oats, and maize. Vines are largely cultivated in various parts, and orchards are numerous. The chief wealth of the country, however, lies in its mineral products, which include, besides immense quantities of iron, lead, copper, gold, silver, marble, limestone, and slate, with abundance of salt and coal. The chief industries are thus necessarily in connection with the production of iron and steel, and their manufacture into articles of such excellent quality as to be in great demand in other countries. There are also manufactures of brass and lead articles, earthenware, paper, tobacco, glass, white-lead, copper hammers, and of cotton, linen, cloth, &c. S. was anciently divided between Noricum and Pannonia, and has generally followed the fortunes of the two provinces of Upper and Lower Austria.

STYX (Gr. *stug-*, to hate, abhor), a waterfall in Greece, near the town of Nonacris, in the north-east of Arcadia, descends perpendicularly over lofty and precipitous rocks, and forms a small torrent, which falls into the Crathis. The scenery around it is weird and desolate, so that the Greeks regarded the S. with superstitious awe, the water being supposed to be poisonous, and to break every vessel into which it was put, except those made of the hoof of a horse or an ass. It was reported that Alexander the Great had been poisoned by it. It is now called *ta Mauraneria* (the Black Waters), and also *ta Drakoneria* (the Terrible Waters), the belief in its poisonous qualities still surviving.—In Mythology, the S. was a river of Hades, round which it flowed seven times, and over which Charon (q. v.) conveyed the shades of the departed. As a goddess, S. was the daughter of Oceanus and Tethys, dwelling in a grotto at the entrance of Hades. She was the confirmer of the most solemn oaths of the gods.

SUA'BIA (Ger. *Schwaben*), **SWABIA, or SUEVIA**, an ancient duchy, in the south-west of Germany, so named from a horde of Suevi, who spread over it in the 5th c., and amalgamated with the Alemanni, its previous inhabitants. It existed as a great

duchy of the Frank Empire till the 8th c., when Alsace and Rhætia were separated from it, and the remainder, retaining its name of S., was thenceforth governed by *nuntii cameræ*, or royal delegates, one of whom having in 915 usurped the title of Duke of Alemannia, was condemned by the German Diet, and decapitated in 917. S. at this time was bounded on the W. and S. by the Rhine, on the E. by the Lech (which separated it from Bavaria) and Franconia, N. by the palatinate of the Rhine and Franconia; and contained about 13,000 English square miles. In 918, however, S. was acknowledged as a ducal fief of the Empire; and after changing hands several times, was (1080) bestowed upon Count Frederick of Hohenstaufen (q. v.), the founder of the illustrious House of this name, also known as the House of Suabia. Under the rule of this prince and his successors, S. became the most rich, civilised, and powerful country of Germany, and the ducal court was the resort of the Minnesingers (q. v.); but the wars of the Guelphs and Ghibellines, and the quarrel with the French respecting Naples, put an end to the dynasty in 1268. The ducal vassals in S. rendered themselves almost independent, and professed to acknowledge no lord but the emperor. During these dissensions arose the lordships of Würtemberg and Baden, with numerous lesser states, holding direct of the crown, and opposed to them the cities, which strove also for an equal independence, and at last, in reward of important service, obtained in 1347 great additional privileges. A number of them united to make common cause against the neighbouring feudal lords in 1376 (known as the *First Suabian League*); an opposite league was formed between Würtemberg, Baden, and 17 towns in 1405, called the League of Marbach; and both took part in the war of Swiss independence, the former in support of the Swiss, the latter of the Austrians. At last, the towns, which had been rapidly increasing in wealth and power, decided at Ulm, in 1449, to form a standing army, and a permanent military commission, for the forcible preservation, if necessary, of peace and order; and the Count of Würtemberg, the most powerful of the opposite party, having joined them, was appointed military chief of the league, which ultimately grew up into the *Great Suabian League*, and exercised both administrative and judicial authority over the whole country, effectively repressing feudal quarrels. In 1512, S. became one of the ten circles into which Germany was now divided, received its complete organisation in 1563, and retained it almost without change till the dissolution of the Empire in 1806. But during this period, the wars of the towns with Würtemberg, the Peasants' War, of which S. was one of the foci, the Thirty Years' War, and those between France and the Empire, destroyed the democratic constitution of the towns, and with it their energy, and then their prosperity disappeared, leaving now no relic which could suggest their former great political importance.

SUA'KIN, a seaport belonging to Turkey, on a small rocky island in the Red Sea, off the west coast of Africa, but near the shore, in lat. about 19° 10′ N. It has a good harbour, and a considerable trade, especially in gums; and it is a station for pilgrims passing to and from Africa. Pop. estimated at 8000.

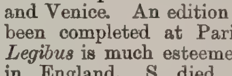
SUARES, FRANCISCO, the most celebrated of the modern scholastic and polemical divines of the Roman Catholic Church, was born at Granada in 1548. His early studies were singularly unpromising; and it is remarkable, in the history of a man afterwards so eminent, that it was not without great difficulty, and after repeated trials, that he obtained admission into the Society of the Jesuits. His later career, however, was brilliant, quite in proportion to the dulness of his first beginnings; and he taught philosophy and theology with remarkable success, first at Alcala, and afterwards at Salamanca, Rome, and Coimbra. The accounts given of his habits of application to study are almost beyond belief. He is said to have habitually devoted seventeen hours a day to study. Of his power of memory, the marvels related are scarcely less prodigious. He is said to have been able to repeat at will any portion of the whole 23 folio volumes of his own works, even to the quotations from the Fathers and other theological writers with which they abound. S. may truly be described as the ablest and greatest of the modern scholastics; but in his works scholasticism appears in its best form; for although they abound in discussions uninteresting, and indeed unintelligible, to persons unacquainted with scholastic terminology, yet they may also be truly said on each subject to exhaust the whole of the learning, ancient and modern, which existed relating to that subject at the date of their publication. On the philosophy of the ancients S. is especially copious and accurate; and of most of the modern German philosophy we may find the germ in the pages which he devotes to the account of the opinions of the ancients.

In the scholastic controversies on Grace and Free Will, S. was strongly opposed to the Thomistic doctrine; but he also rejected the opposite system of Molina. See MOLINISM. The scheme of reconciling the freedom of the will with the efficacy of grace, and of saving at the same time the doctrine of 'special election,' devised by S., is called *Congruism*, and is explained under the head MOLINA. The works of S. are entirely theological, or ascetic, and were printed in 23 vols. folio at Lyon, Mainz, and Venice. An edition in 28 vols. 4to has recently been completed at Paris, 1861. His treatise *De Legibus* is much esteemed, and has been reprinted in England. S. died at Lisbon in 1617.—See Des Champs, *Vie de Suares* (4to, Perpignan, 1671).

SÛ'BAHDÂR was, under the Mogul government, the title of a governor of a province. It now designates a native officer, holding a rank equivalent to that of captain under the European officers.

SUBA'LTERN, in the Army, or rather in a regiment, is a company officer below the rank of captain; i. e., a lieutenant, ensign, or cornet.

SUBDO'MINANT, in Music, the fifth below the tonic; the note whose dominant is the tonic. Thus F is the subdominant of C, and C of G. One of the keys most nearly related to any key is its subdominant; and the easiest of all modulations is that from a key to its subdominant, which is effected by adding the dominant seventh to the common chord, and the resolution of this chord is the common chord of the subdominant; e. g., in modulating from the key of C to the key of its subdominant F, we have


. See DOMINANT.

SUBIA'CO, a city of the former Papal States, capital of the province of that name. Pop. 16,340. It is built upon a hill, on the right bank of the Teverone, contains a very fine cathedral dedicated to St Andrew, many monuments of antiquity, and some handsome palaces. In its neighbourhood, there are many petrified trees. The surrounding mountains abound in fine marbles. In S., the order of St Benedict was instituted; and in the 15th c., one of the earliest

printing-presses in Italy was established, the editions issued from which are greatly sought after.

SUBJECT. See OBJECT.

SUB-KINGDOMS, ANIMAL, a term which has recently begun to be used by zoologists to designate the great primary divisions of the animal kingdom, as *Vertebrata*, *Mollusca*, &c.—In like manner, *sub-families* are distinguished, as *Arvicolinæ* (*Arvicolidæ* of others) as a sub-family of *Muridæ*, and *Phœnicopterinæ* as a sub-family of *Anatidæ*. The form of the name is, however, different in different branches of natural history. The terminations *-idæ* and *-inæ* distinguish the families and sub-families in some departments of the animal kingdom. This distinction is not yet recognised in the insect tribes.—In Botany, the natural orders are generally designated by names ending in *-aceæ*, and the sub-orders or tribes by names ending in *-eæ;* but this rule is not fully adopted, except by Lindley, and those who follow his system.

SUBLAPSA'RIAN (Lat. *sub-lapsum*, after the Fall), the name given to one section of the school of divines, who maintain the doctrine of absolute decrees of Election and Reprobation. It is possible to conceive God making such a decree in two different ways, either on the hypothesis of His foresight of the fall of Adam, and thus of original sin, or, independently of such foresight on His part, and without any reference to such foresight, and entirely out of His own free will and determination. The Sublapsarian system supposes the former; and thus refers the eternal election or reprobation of men by God to His foreseeing that all men would fall in Adam, and thus would deserve eternal reprobation. Out of the entire mass of mankind thus fallen, He freely pre-elects some to life, and equally freely pre-dooms others to death. This distinction is not confined to the Calvinistic schools of divinity; it is also found among the Roman Catholic. But even the most extreme of the latter contend that in this system the liberty of man is not destroyed, inasmuch as they hold that, even on the supposition of the fall of Adam, 'sufficient grace' is offered to all men; and no one is pre-doomed to death except on the hypothesis of the prevision, on God's part, of this particular individual's having freely sinned.

SUB-LIEUTE'NANT is the junior combatant commissioned officer in the royal navy. When a midshipman has served six years, and can pass in seamanship and certain other subjects, he becomes a sub-lieutenant, and is eligible for promotion to lieutenant, on opportunity occurring. The pay of a sub-lieutenant is £91, 12*s*. 0*d*. a year, and the half-pay, £45, 12*s*. 6*d*. An officer usually serves but a short time in this ill-paid rank. Until within a few years, the sub-lieutenant was called a Mate (q. v.).

SUBLIMA'TION is a chemical process similar to distillation, but differing from it in the nature of the substances to which it is applied. While in distillation, *liquids* are converted by the agency of heat into vapour, which is condensed in the liquid form usually by the cooling action of water; in sublimation, *solid* bodies are reduced by heat to the state of vapour, which reassumes the solid form on cooling. Sublimation is usually conducted in a single vessel of glass or iron, the product being deposited in the upper part of it in a solid state, while the impure residue remains at the bottom: but in the case of sulphur, the vapour is condensed on the walls of a large chamber. Iodine affords a good example of sublimation. On gently heating the lower part of a Florence flask containing a little of this substance, a purple vapour arises, which almost immediately condenses in small brilliant dark purple crystals in the upper parts of the flask, while any impurity that may be present remains at the bottom. Amongst the substances obtained by this process, and employed in the Pharmacopœia, are arsenious acid, benzoic acid, corrosive sublimate, and sublimed sulphur.

SUBLI'ME. Objects indicating great Power, vast Expanse, or lofty Elevation, excite in the beholder a feeling of pleasurable elation; and the name 'sublime' is applied both to the objects and to the feeling.

The precise quality in things that arouses this mode of pleasurable excitement, has been variously assigned. According to Burke, *terror* is, in all cases whatsoever, either more openly or more latently the ruling principle, or, at all events, one of the chief sources of Sublimity: Blair suggested that *mighty power or force* is the cause; Payne Knight ascribed it to *mental energy;* Kaimes considers it due to *height or elevation;* Dugald Stewart, in an elaborate essay, affirms that *elevation* is the leading characteristic, and that expanse and power are sublime by suggesting or implying great height; Sir W. Hamilton says that Sublimity requires *magnitude* as its condition, and exists in three forms—Space, Time, and Power.

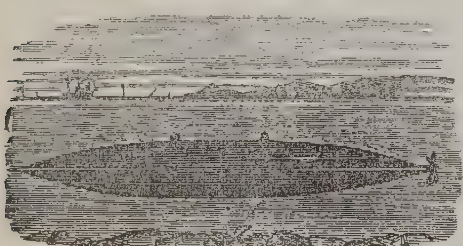
The feeling itself has also been described variously. If this could be fixed, we should have a key to the objective quality. Longinus characterised it, in reference to literary composition, as 'filling the reader with a glorying, and sense of inward greatness.' Some would call it a 'sense of security' in circumstances of terror or danger. Hamilton describes it as 'a mingled feeling of pleasure and pain —pleasure in the consciousness of the strong energy, pain in the consciousness that this energy is vain.' The connection with the sentiment of Power is generally admitted; but as the comparison of the object with self suggests our own littleness at the same time, there may be a doubt as to whether the emotion is due to the Power, to the Littleness, or to the combination of both.

Referring to the generic sentiment of Power, which is evidently at the foundation, we find that the feeling of superior might in ourselves is cheering, elating, stimulating; and that the sense of littleness or inferiority is a depressing and enfeebling state of mind, a state of pure pain, redeemable in certain circumstances by other feelings, as when our inferiority is only in the comparison with an object of love or veneration, or when it is the condition of some compensating superiority—'the courtier stoops to rise.' The presumption, therefore, is that the elation of the Sublime is connected with the notion of Power. It may be felt although the power is not actually possessed, but imagined, borrowed, or conceived, through a sort of sympathy with the *appearances* of great power or might. If this account of the Feeling be correct, Power must be a principal quality in its Objects; and if with this we combine voluminous sensation (and the corresponding ideas, vastness of expanse and greatness of time), we shall probably be able to explain the Sublime in all its forms.

SUBMARI'NE FORESTS occur at several places around the shores of Britain and Ireland. They consist of beds of impure peat, containing the stools of trees which occupy the sites on which they grew; but by change of level, the ancient forest surfaces are now covered by the tide even at low water. No kind of tree has been found in these forests which does not exist at the present day in the country, and the underwood and herbaceous plants, as far as they have been determined, agree specifically with those found now in similar

localities. Submarine forests belong to the Recent or Quaternary period, and occur above the Boulder Clay.

SUBMARINE NAVIGATION. When the Diving-bell (q. v.) had shewn that air for respiration can be supplied to persons placed in adequately arranged vessels under water, ingenious men began to speculate on the possibility of navigating closed ships or boats in similarly exceptional circumstances. Cornelius Drebell made a vessel to be rowed under water, and James I. caused it to be tried on the Thames. What was the exact nature of this invention, does not seem to be now known. Boyle said of it that it comprised an arrangement whereby 'the composition of a liquid speedily restored to the troubled air such a proportion of vital parts as would make it again for a good while fit for respiration.' Bishop Wilkins, in his *Mathematical Magic*, speculated 'concerning the possibility of framing an ark for submarine navigation;' he spoke of the wonderful advantages of such a contrivance, but, unfortunately, did not describe the contrivance itself. In 1774, an inventor named Day lost his life during an experimental descent in Plymouth Sound, in a vessel of about 50 tons burden; he intended to make it rise after a submersion of considerable duration, but failed. Mr Bushnell, of Connecticut, contrived in 1775 a submarine vessel, intended to have been used in warfare; it appears to have been propelled by some kind of Archimedean screw. Robert Fulton, while at Paris in 1796, invented a box which, when filled with combustibles, might be propelled under water, and made to explode beneath the bottom of a ship, so as to blow it up; but the attempt was a failure. He also made a submarine boat for the same purpose, which was tried on several of the French rivers with partial success; later in his life, he really blew up an old ship's hull by such means in America. Some of the suggestions for submarine navigation have depended on the ship or boat carrying store-vessels filled with oxygen, to replenish the air, the carbonic acid being absorbed either by cream of lime or a strong solution of ammonia. Attention was directed, in 1859, to a submarine boat, brought to Britain by Mr Delaney of Chicago. According to his patent,



Delaney's Submarine Boat.

the vessel was egg-shaped in transverse section, and diminished nearly to a point at each end. There was a rudder at one end of a hollow shaft; and the axis of a screw-propeller passed through the shaft. The boat was completely enclosed on all sides, except certain pipe-openings. There were two iron tanks in the interior; one had air forced into it by an air-pump; a pipe, with a stopcock, communicated with the second tank, which contained water. The engineer of the boat, by pumping water into or out of the second tank, through the action of the air in the first, could raise or lower the boat to different depths in the water. A steam-engine was to furnish the propelling power, and provision was made for purifying the respired air; but the details of operation were by no means clearly described. Torpedos and other destructive contrivances, though acting under water, yet not containing men, are not properly submarine vessels. See TORPEDOS.

SUBO'RDINARY, or SUBO'RDINATE ORDINARY, in Heraldry, a name given to a certain class of charges mostly formed of straight or curved lines. Heralds vary a little in their enumeration, but the following are generally held to come within this category: the Bordure, the Orle, the Tressure, the Flanche, the Pile, the Pall, the Quarter, the Canton, the Gyron, the Fret, the Inescutcheon, the Lozenge, the Fusil, and the Mascle. Each subordinary will be found noticed under a separate article. Some heraldic writers account the Pile an ordinary, and the diminutives of the ordinaries are sometimes ranked as subordinaries. See ORDINARIES, HONOURABLE.

SUBORNA'TION OF PERJURY is the offence of procuring another to take such a false oath as constitutes Perjury (q. v.) in that other. It is a misdemeanour, punishable anciently by death; afterwards banishment, or cutting out of the tongue; then forfeiture of goods; and latterly, as at present, by fine and imprisonment.

SUBPŒ'NA, in law practice, means the writ or process by which the attendance of a witness at a court of justice is compelled for the purpose of testifying in civil cases in the county, and in criminal cases when in the state. In civil cases, when the witness is out of the county, the testimony is procured by means of deposition. When the witness has been duly subpœnaed, and refuses to obey, the court can compel his attendance by means of a writ of attachment, and punish him for contempt of the court. A subpœna is directed to the sheriff of the county where the witness may be found, and the sheriff may by writing therein depute any disinterested person to serve and return such subpœna.

SUB RO'SA, 'under the rose'—i. e., between ourselves, or in secrecy. It was customary among the ancient Germans, on occasions of festivity, to suspend a rose from the ceiling above the table, as a symbol that whatever was said during the feast by those present would be afterwards forgotten, or at least be kept as a secret among themselves.

SU'BSIDIES, a term in Politics, used in two different senses: 1. It is applied in English political history to taxes levied not immediately on property, but on persons, in respect of their reputed estates in lands or goods; or customs imposed on any of the staple commodities in addition to the *costuma magna et antiqua*. Thus, 30,000 sacks of wool were granted to Edward III. in 1340, in aid of the war with France. Subsidies were granted on various occasions to James I. and Charles II. 2. The same word is used to denote money paid by one state to another, in order to procure a limited succour of auxiliary troops, ships of war, or provisions. In the time of the war with the revolutionists of France and Napoleon I., Great Britain furnished subsidies to foreign powers to a large extent, in order to engage them to resist the progress of the French. In questions regarding subsidies, it is held that the state furnishing the succour does not thereby become the enemy of the opposite belligerent: it may remain neutral in all respects, except as regards the auxiliary forces supplied. Such, for example, was long the attitude maintained by the Confederate Cantons of Switzerland: while granting troops to the various European powers, they were in the habit at the same time, of preserving a rigorous neutrality. The service of Swiss regiments abroad is no longer sanctioned. The federal constitution of Switzerland, of 12th September

1848, prohibited the conclusion of military capitulations, and on 30th July 1859, a proclamation was issued by the Federal Council, forbidding any Swiss subjects from taking service under a foreign power, without the authorisation of the council.

SUBSTANCE, a word connected with certain discussions in Logic and Metaphysics. Substance is correlative with Quality or Attribute. Every substance must have attributes, and every attribute must be the attribute of some substance. The substance gold has the attributes weight, colour, &c. But as every power or property of a thing, every way that the thing affects us, may be called an attribute or quality, if all the attributes are counted off, there is nothing left; and the question then arises: What is the *substance?* To avoid this seeming inconsistency, it was assumed that everything whatsoever possesses, besides its attributes, an unknown substratum that they rest upon, or inhere in—a mystical and inscrutable bond, that holds the attributes together, without being itself an attribute. This gratuitous assumption of what is, after all, a nonentity, was repudiated by Locke and others, who found a meaning for substance without departing from the knowable. Every object has some *essential* or *fundamental* quality, which being present, it preserves its identity; and which being removed, it is no longer the same object, but another. Thus, the substance of Body or Matter is not the remnant after all the qualities are subtracted; it is the two fundamental and inerasable qualities, Extension and Resistance. Size, shape, colour, heat, odour, &c., may all be varied; but so long as Extension and Resistance, in any degree, are found, we have a piece of matter. On the same view, the substance of Mind is whatever we regard as its fundamental essence, or distinguishing marks. We may adopt Feeling, or Volition, or Intellect, or require a share of all three, according to our mode of defining the mind. It would, then, be a mere confusion of language to talk of Feeling, Volition, and Intellect as *inhering* in mind; they *are* mind, and there is nothing besides.

Notwithstanding the obviousness of this explanation, the employment of the words Substance and Attribute has led to such an inveterate demand for something that shall underlie all attributes—a substance of body, and a substance of mind—distinct from anything meant by the names, that many philosophers have considered it necessary to preserve the phantom as a thing of belief, if not of knowledge. The doctrine of an unknowable substance in the abstract very early allied itself with the popular theory of the Perception of a material world (see PERCEPTION), and the same arguments are good, for or against both. Other names for expressing the same contrast are *noumenon* and *phenomenon*. The Phenomenon is what shews itself to our senses, or is conceived by our intelligence—the qualities of extension and resistance in body; and of feeling, &c., in mind. The Noumenon is something apart and beyond, something inconceivable and unknowable, but which, say some, we are instinctively led to believe in. Thus, in the great question above alluded to—the belief of an independent material world—the phenomenal manifestations are inextricably involved with our mental powers of conceiving, and would vary, if these were to vary; consequently, they cannot be the absolute, independent, self-existent reality; which drives one school of philosophy upon the expedient of believing in such a reality, although it must be for ever incomprehensible to us.

SU'BSTITUTE, MILITARY. In nations where conscription is resorted to for the supply of soldiers for the army, the lot often falls on those unwilling to serve in person. In such a case, the state agrees to accept the services of a substitute—that is, of a person of equally good physique. Unless the levy be very extensive, or the term of military service very long, substitutes are readily found among military men who have already served their prescribed period. Of course, the substitute must be paid for the risk he runs. His price depends, like all other saleable articles, on the demand and supply. Happily, in Great Britain, few of those now living have ever known when substitutes were necessary. It is, however, to be remembered that the act for a militia ballot hangs continually over us, and is only suspended by a special act of parliament from year to year.

SUBSTITU'TION is one of the three principal methods employed in examining the chemical composition of organic bodies, and in tracing their relation to other compounds; the two other methods being those of *oxidation* and of *reduction*. Although the term is restricted to organic chemistry, the ordinary method of preparing insoluble inorganic compounds by double decomposition is in reality a case of substitution of one base or one acid for another. If, for instance, solutions of nitrate of lime and sulphate of soda are mixed together, the resulting compounds are sulphate of lime and nitrate of soda, in which the lime is substituted for the soda, and the soda for the lime. In some cases, an element may be replaced (or, more correctly, displaced) by a compound group; thus, cyanogen, CN or Cy, may take the place of oxygen, as, for example, in the reaction that ensues between hydrocyanic acid and red oxide of mercury, when cyanide of mercury and water are formed, as shewn in the equation: $H(CN) + Hg_2O = Hg_2(CN) + HO$. Similarly, the groups NO_4, SO_2, and NH_2 may often be substituted for hydrogen. In various organic bodies, one or more atoms of hydrogen may be displaced by one or more atoms of chlorine, a fact which was originally observed by Gay-Lussac in noticing the action of chlorine on wax. The new product thus formed is almost always analogous in its nature to the compound from which it is produced; thus, according as the substance acted on by the chlorine is an acid or a base, the resulting product is an acid or a base, and the number of atoms is always the same in the original substance and the product. The following examples will elucidate the above remarks: If acetic acid, $C_2H_4O_2$, be exposed to the action of chlorine, we obtain, according to the duration and modifications of the action, the two compounds, monochloracetic acid, $C_2H_3ClO_2$, and trichloracetic acid, $C_2HCl_3O_2$, in the former of which, one atom, and in the latter, three atoms, of hydrogen, are displaced by a corresponding number of atoms of chlorine. Hydrochloric ether, $C_2H_5.Cl$, may be made to yield the following succession of compounds, in which a gradually increasing amount of the hydrogen is displaced by chlorine, until, in the final result, the hydrogen has altogether disappeared. The consecutive compounds thus resulting from hydrochloric ether, $C_2H_5.Cl$, are (1) chlorinated ether, $C_2(H_4Cl)Cl$; (2) dichlorinated ether, $C_2(H_3Cl_2)Cl$; (3) trichlorinated ether, $C_2(H_2Cl_3)Cl$; (4) tetrachlorinated ether, $C_2(HCl_4)Cl$; and (5) sesquichloride of carbon, $C_2(Cl_5)Cl$. 'The chlorine,' says Professor Miller, 'appears to have taken the place of hydrogen in the group without disturbing the relative position of the other elements which enter into its formation; just as a brick in an edifice may be conceived to admit of being renewed, whilst its place is supplied by a block of wood or of stone, without altering the form or symmetry of the building.' Substitutions of

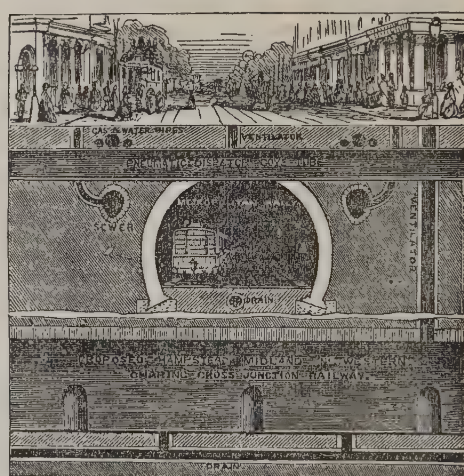
bromine and iodine for hydrogen may be effected in the same way as has been shewn to occur in the case of chlorine. The study of the artificial formation of organic bases has led to the discovery of many remarkable instances of substitution products. If, for example, bromide of ethyl, C_2H_5Br, be heated in a sealed tube with a solution of ammonia in alcohol, hydrobromate of ethylia (or ethylamine) will be formed, and on distilling the vapour with hydrate of potash, one of the products will be a new base, ethylamine, C_2H_7N, which may be regarded as ammonia, NH_3, in which one atom of hydrogen has been displaced by one atom of ethyl, C_2H_5. By a similar proceeding, we may successively displace the second and the third atoms of the hydrogen in the ammonia; and we thus obtain two more complex bases, diethylamine, $C_4H_{11}N$, and triethylamine, $C_6H_{15}N$.

SUBTRA'CTION, one of the four fundamental processes of Arithmetic, is the diminution of a quantity by the removal of a certain portion of it. It is consequently the reverse of *Addition*, and determines how much of any quantity remains after a certain quantity has been taken from it. In cases where the digits of the number to be subtracted are greater than the corresponding ones of the number to be diminished, two methods of operation may be adopted.

(1)	(2)	(3)
7324	7 (13) (12) 4	6 (12) (12) 4
1842	(2) (9) 4 2	1 8 4 2
5482	5 4 8 2	5 4 8 2

For example, in subtracting 1842 from 7324, the numbers are written as in form (1). The method of operation usually followed is to make an addition mentally to the upper figure when necessary, and then compensate for this by an equivalent addition to the next under figure, as represented in form (2). Thus, 10 'tens' are added to 2 'tens,' to enable 4 'tens' to be subtracted, and this addition is compensated for by an equal increase of the under line by 1 'hundred,' through the change of 8 'hundreds' into 9 'hundreds.' The more simple and directly intelligible plan, shewn in form (3), is to borrow a unit of the next higher degree in the upper line, care being taken to remember, in the partial subtraction immediately succeeding, that the upper digit must be considered as less by unity than it appears.

SUBWAYS. The system of engineering *beneath* the public streets has not by any means yet reached its full development. The Metropolitan or Underground Railway, opened in 1863, was the first example of its kind; the passengers going down stairs from the side-pavements to stations underneath the carriage-way. The pneumatic propulsion of mail-bags (see PNEUMATIC DISPATCH) has given rise to projects for a similar mode of propelling railway trains beneath streets and roads. One such, the Waterloo and Whitehall Railway, was commenced about 1865 to pass under the Thames; want of funds led to its abandonment after shafts had been sunk. But the term *subways* is usually applied, not to such tunnelled passages for travelling, but to roomy archways that will contain sewer-pipes, water-pipes, and gas-pipes. It has been long considered a defective system that whenever such pipes need repair, the surface of the street has to be broken up to get at them, thereby causing great expense and great interruption to traffic. When the Metropolitan Board of Works commenced their series of improvements, they resolved on the trial of subways for this useful purpose. They began with a new street, extending from Covent Garden Market to St Martin's Lane, opened in 1861. Underneath the carriage-way on this street, there is a subway, a central arched passage or tunnel 12 feet wide by 6½ feet high; with arched side-openings, for house service-pipes, connected with the cellarage of the several dwellings. In this subway are water-pipes, gas-pipes, and electro-telegraphic wires, all easy of access by side entrances to the subway, of sufficient size to admit workmen, pipes, &c. In this instance, the main sewer is not in the subway itself, but underneath it, provided with man-holes, gullies, ventilating shafts, &c. The improvement was long delayed on account of doubts entertained as to whether the ventilation would be sufficient to overcome the dangers arising from the leakage of the gas-pipes; and there can be



Section of Underground Works at the Junction of Hampstead Road, Euston Road, and Tottenham Court Road.

(From *Illustrated London News.*)

no doubt that care will be needed in making and sealing the pipe-joints. A second example is afforded by Southwark Street, a noble new street, lately formed from Blackfriars Road to the southern foot of London Bridge. Underneath this street extends a subway, excellently planned for the purposes above mentioned. Two street lamp-posts, of unusually elegant design, one at each end of the bridge, act as ventilating shafts for the subway; and there are other ventilators along the route, besides side entrances for workmen. A curious proof has been furnished, however, of the anomalies which so frequently mar our public works. In 1865, a gas company broke up the roadway, and broke through the well-built crown of the arch of the subway, to get at their gas-pipes for purposes of repair or adjustment. It was found, on investigation, that no one had power to prevent them. The act empowered the Metropolitan Board of Works to make a subway for the use of gas companies, water companies, &c.; the gas company, on the other hand, were empowered by *their* act to break up the public roadways to get at their pipes; the Board could not compel the company to adopt the new plan, because the powers were only permissive, not obligatory. Thus, a useful reform was rendered in part nugatory by a bungling in the preparation of an act of parliament. It is to be hoped that two new streets sanctioned, and likely to be proceeded with in 1867 and later years, from Blackfriars Bridge to Cannon Street, and from Tottenham Court Road to Charing Cross, will have subways

better guarded against such absurd anomalies. The water companies and gas companies fear incurring additional expense; and there is known to be a difference of opinion among engineers concerning the danger from leakage and explosion when the two sets of pipes are enclosed in the same archway. The system is likely to receive a fair trial in some provincial towns, where the gas and water arrangements are not so complex as in the metropolis. An important subway was constructed in 1866 in connection with the Thames Embankment from Westminster to Blackfriars. Indeed, between the masonry of the river-wall and the present line of high water, there will be no less than three tunnels or arched passages under the surface of the ground. One will be the Metropolitan District Railway, in its course from the east to the west of London; another will be the Low Level Sewer of Great Main Drainage System, to join the outfall at Old Ford; while a third will be a subway to contain gas and water pipes, telegraph wires, &c. Most of these brick tunnels will be in newly-made ground, on a site which, until recently, was twice daily covered with the tidal waters of the Thames. And not only so, but another subway or tunnel will pass underneath and at right angles to all these three, to carry the Middlesex end of the Whitehall and Waterloo Railway, already mentioned. Very careful engineering is required in these extraordinary works.

SUCCE'SSION is a legal term used in Scotland, but not used technically in England, where the same subject is spoken of under the name of Next of Kin (q. v.), and Descent; see also INTESTACY, STATUTE OF DISTRIBUTIONS, EXECUTORS, ADMINISTRATOR. In Scotland, the term is used to denote the taking of property by one party in place of another. Where the devolution takes place in consequence of a conveyance from the proprietor, the acquirer is termed a singular successor, as the conveyance is the single title under which he acquires. Where, however, the person dies intestate, his heir succeeds to the whole of the heritage, and is called the universal successor. Where no will or disposition by the owner is executed, the law makes a disposition for him, and distributes the property according to certain rules of relationship by blood. 1. In the case of heritable succession, Primogeniture (q. v.) is the rule, the eldest son and his issue taking the property; and after that stock is exhausted, the next eldest son; and so on. When males fail, then the succession opens to the daughters, who take not in order of seniority, but all together, and are called Heirs-portioners (q. v.). When descendants fail, then the succession goes to collaterals; thus, brothers and sisters succeed first—the brothers according to a certain priority, and, failing them, the sisters all together as heirs-portioners. When the descendants and collaterals are exhausted, the succession then goes to ascendants (the mother, however, being entirely excluded), the father first, and then uncles and aunts, &c. In heritable succession, the right of representation exists, i. e., when an heir is dead, his children represent him, and take that share which, if alive, he would have taken. Brothers and sisters consanguinean, i. e., by the same father, but not by the same mother, succeed after brothers and sisters german (i. e., by the same father and mother), before the remoter line of the full blood. The English law of descent or succession differs considerably from the above. See INTESTACY, and Paterson's *Comp. of English and Scotch Law* (2d ed.), s. 751, *et seq.*—2. As to succession in movables, or to the personal property of the intestate, see NEXT OF KIN. There are taxes called succession duties, which are payable to the revenue on all property, real and personal, acquired by succession The duty payable on lineal issue or lineal ancestors is 1 per cent.; by brothers and sisters and their descendants, 3 per cent.; and so on, the duty increasing as the relationship is more distant. The husband or wife of the proprietor is exempted from the duty.

SUCCESSION ACTS. From a comparatively early period in English history, parliament occasionally exercised the power of limiting or modifying the hereditary succession to the throne. The first instance of such interference occurred in the reign of Henry IV., who possessed himself of the crown, to the prejudice of the descendants of Lionel, Duke of Clarence, second son of Edward III. Act 7 Henry IV. c. 2 confirmed the title of that monarch, and declared Prince Henry heir-apparent of England and France, with remainders to Henry IV.'s other children. Parliamentary interposition was subsequently exercised in the case of Henry VII. and in regard to the immediate successors of Henry VIII. The respective rights of James I., Charles I., and Charles II. were acknowledged by parliament; and in the case of Charles II. the crown was held to have devolved on him immediately on the death of his father.

The revolution of 1688 was founded on the so-called abdication of the government by James II. See ABDICATION. The Convention bestowed the crown on William and Mary for life, and regulated the claims of Anne. On the impending extinction of the Protestant descendants of Charles I., the crown was settled by 12 and 13 Will. III. c. 2, in the event of the death of William and Anne without issue, on the next Protestant line, according to the regular order of succession—viz., the descendants of the Electress Sophia of Hanover, granddaughter of James I.; and it was at the same time enacted, that whoever should hereafter come to possession of the crown, should join the communion of the Church of England as by law established. This is the latest parliamentary limitation of the crown; but the right of parliament to limit the succession has been secured by 6 Anne, c. 7, which attaches the penalties of treason to the 'maliciously, advisedly, and directly' maintaining, by writing or printing, that the king and parliament cannot make laws to bind the succession to the crown, and the penalties of a *Præmunire* (q. v.) to maintaining the same doctrine by preaching, teaching, or advised speaking.

SUCCESSION WARS were of frequent occurrence in Europe, between the middle of the 17th and the middle of the 18th centuries, on the occasion of the failure of a sovereign house. The most important of these wars was that of the Orleans succession to the Palatinate (1686—1697), closed by the peace of Ryswick; of the Spanish succession (1700—1713); of the Polish succession (1733—1738), closed by the peace of Vienna; of the Austrian succession (1740—1748); and of the Bavarian succession (1777—1779), called, in ridicule, the Potato-war. Of these, the second and fourth were by far the most important, and a brief notice of their course and conclusion is subjoined.

SUCCESSION, WAR OF THE SPANISH, arose on the death, without issue or collateral male heirs, of Charles II., king of Spain, 3d November 1700. The nearest natural heir to the throne was of the royal line of France, Charles's elder sister having married Louis XIV.; but to prevent any possible union of the two crowns, a solemn renunciation had been exacted both from Louis and his queen, for themselves *and their heirs*; and this renunciation having been ratified by the king and Cortes of Spain, was made as binding as legal forms could make it

Failing the Bourbons, the next heirs were the descendants of the younger sister of Charles, who had married the Emperor Leopold I., and from whom no renunciation had been exacted; and the only issue being a daughter, who had married the Elector of Bavaria, and borne a son, Joseph-Ferdinand, this prince was during his lifetime regarded both by Charles II. and the Spanish people as the rightful heir. But dying in 1699 without issue, the question of succession was reopened, Louis XIV., failing his wife's rights, claiming for himself, as the son of Philip IV.'s elder sister (being, however, again legally barred here by another solemn renunciation); while the Emperor Leopold, maintaining with justice that the Bourbons were by these two renunciations wholly deprived of all their rights of heirship, claimed the throne as the son of Philip IV.'s younger sister. The other powers of Europe, especially Britain, Holland, and Germany, warmly interested themselves in the matter, as a question of policy, and with good reason; for not only was the crown of Spain a valuable prize in itself, carrying with it the sovereignty of the Netherlands, the Milanese, Naples and Sicily, and immense possessions in America, but its union with France or Austria would of a certainty endanger the independence of every other sovereignty in Europe. Both claimants bade for the support of the maritime powers, the one by renouncing his claims in favour of his second grandson, Philip of Anjou, the other by putting forward his second son, Charles, as his substitute, while both solemnly promised never to undertake the union of the two crowns. The Austrian party at first preponderated in Spain; but Louis, by able and unscrupulous policy, succeeded in undermining the Austrian influence at Madrid, and in having Philip declared the heir (October 2, 1700). On the death of King Charles, a month after, Philip appeared in Spain, and was well received by all classes, and at once recognised as monarch, an example gradually and unwillingly followed by all the European powers excepting the emperor; for at that time the dread of Louis XIV.'s power pressed like an incubus on the nations of Europe. However, the French monarch, by various ill-advised acts, chiefly by his support of the elder Pretender (the son of James II.), whom he recognised as sovereign of Britain, and by occupation of the Netherlands and menacing treatment of Holland, stirred up such general resentment, that William III. was enabled to revive the *Grand Alliance*, and his successor, Anne, to join with Holland and Austria in declaring war against France and the 'Spanish usurper,' 15th May 1702.

Hostilities at once commenced: a combined British-Dutch-German army under Marlborough attacked the French in Belgium, and captured one by one their fortresses on the Maes, while the Reichs army (Germany having declared for Austria), under the Markgraf of Baden, crossed the Rhine, and took Landau. Austria herself had, however, commenced the contest in the previous year, by sending into Italy Prince Eugene (q. v.) of Savoy-Carignan at the head of a veteran army of 32,000 men, who did a good deal of hard fighting, with no adequate result. Meanwhile, the Elector of Bavaria raised an army and declared for France, and a French army under Villars marched to join him. Both were kept in check by the Markgraf for some time; but, in the summer of 1703, Villars burst through the Black Forest, and joined the elector, with the view of penetrating through Bavaria into Austria, but his obstinate ally, the elector, was determined to invade the Tyrol instead, and join Vendome in Northern Italy—a scheme which ended most disastrously; and Villars returned in disgust to France. In the Low Countries, Marlborough employed himself in gradually depriving the French of their strongholds: and in Italy, the Austrians were driven from point to point, till nothing remained to them but a few districts on each side of the Po; they were, however, relieved towards the close of the year by the defection of the Duke of Savoy, who joined the grand alliance 25th October 1703, an event which compelled Vendome to return to Piedmont. The first great blow was struck in the following year, when the combined Austrian-German-British army, under Marlborough, totally defeated the French and the elector at Blenheim (q. v.), driving the débris of their forces almost to the foot of the Vosges. After this, the French never obtained a permanent footing in Germany. The campaigns of Marlborough in Germany, and of Eugene in Italy, in 1705, were successful but not very important. The year 1706 was another great epoch in this protracted contest; the British and Dutch having freed the valley of the Maes, had forced the French into South Brabant, and Marlborough having, by a stratagem, caused them to march towards Namur, suddenly attacked them at Ramillies (q. v.), and, after a brief combat, put them completely to rout with great slaughter, the elector and Villeroy, the joint commanders, narrowly escaping capture. Louis hastily reinforced his army, and recalled Vendome from Italy to take the command, a step which, however necessary, cleared the way for Eugene, who completely out-generalled his opponent Marsin, and after a memorable march of 34 days, appeared before Turin, and united with the Duke of Savoy. The battle of Turin, in which the gallant Marsin was slain, was one of the most obstinate of the whole war, but its result was as decisive, and from this period the French power in Northern Italy was shattered; and the following year saw the country completely cleared of both French and Spaniards. From 1706 the war in Germany was purely defensive, and no battle worthy of notice was fought. In Italy also the contest on the whole languished, though the Austrian arms were for the most part successful, Mantua and Naples (1708) being subdued, and the pope compelled to preserve neutrality by dread of another sack of Rome. But since the commencement of 1704, another theatre of war had been established by the landing of the Archduke Charles at Lisbon with 8000 British and 6000 Dutch troops, who were joined by the Portuguese (their king having acceded to the alliance against France), and invaded Spain from the west; but nothing of consequence was accomplished till a landing had been effected by the Earl of Peterborough (q. v.), with a small body of troops, in Catalonia. Then attacked both from the west and east, the Bourbon forces were beaten and driven across the Pyrenees, and it was only after the departure of Peterborough that Berwick (q. v.) made head against his antagonists. By his victory at Almanza (25th April 1707), he recovered the whole of Spain except Catalonia. In 1710 Berwick finally left Spain; and the Carlists under Stanhope and Starhemberg again got the upper hand, repossessing themselves of the east of Spain, and of Madrid (28th September). But the arrival of Vendome speedily changed the face of affairs. Stanhope was defeated and captured (9th December) at Brihuega, and Starhemberg was forced to retreat on the following day. The war was thenceforth confined to Catalonia, and was distinguished by no noteworthy incidents. The most important part of the struggle had been meanwhile taking place in the Netherlands, where Marlborough (1707) drew up in concert with Eugene a secret plan of operations which effected a division of the Moselle army under the elector and Berwick from that of the north

under Vendome; whereupon the British and Germans swiftly uniting fell upon Vendome's army at Oudenarde (q. v.) (1708), and before Berwick could come up to its aid, inflicted upon it a severe defeat. The capture of Lille, Ghent, and Bruges necessarily followed. France now began to show symptoms of exhaustion, and made overtures of peace, but these being chiefly illusory, were rejected; and the emperor having largely reinforced Eugene, the allies took the field with 110,000 men, while the French, equal in strength, were now directed by Villars, the most enterprising and fortunate of their generals; but his star, which had hitherto been constantly in the ascendant, fell before that of Marlborough at Malplaquet (q. v.) (September 1709). After some further campaigning, besieging, and negotiating, the opportune death of the emperor (April 17, 1711) rescued France from the brink of destruction; for Britain became immediately lukewarm in support of a cause which would effect the reunion of Austria and Spain; and the Tories having come into power, private preliminaries of peace were signed between Britain and France, 8th October 1711. Eugene, however, continued the war, aided by Holland, and captured Quesnoy; but the defeat and capture of the Earl of Albemarle and the British contingent at Denain (July 1712) so weakened his force, that he was compelled to give way; and in the following spring the Dutch joined the British as parties to the peace of Utrecht (q. v.). The Emperor Charles was also forced to conclude a treaty of peace at Baden, 7th September 1714, which ended the struggle, leaving Philip in possession of the Spanish throne (see UTRECHT, PEACE OF); while Austria obtained the Spanish Netherlands and the Milanese.

SUCCESSION, WAR OF THE AUSTRIAN. The death of the Emperor Charles VI. (20th October 1740), by which the male line of the House of Hapsburg became extinct, was the signal for a general uprising of the powers of Europe, some to prey on the Austrian possessions, and others to aid the eldest daughter and heir of the deceased emperor. The probability of such a contingency had long been foreseen by Charles VI., for as early as 1713 he had published a *Pragmatic Sanction* (q. v.), stipulating that, in default of male heirs, the whole of his dominions should descend undivided to his eldest daughter, Maria Theresa (q. v.); and it was almost his sole aim, during his subsequent reign, to gain the consent of all parties having proximate claims to any of the Austrian domains, and of the principal powers of Europe, to this arrangement. The Elector of Bavaria, Charles-Albert, alone refused to resign his pretensions. On the death of her father, Maria Theresa intimated her accession to the various European powers, and from all of them, except France and Bavaria, received assurances of good-will and support; but notwithstanding, two months did not elapse till Frederick II. of Prussia, without a declaration of war, invaded Silesia. The Austrian treasury was at this time exhausted, and the army much disorganised; so that little or no effective resistance could be made to the Prussians; while the state of alarm into which this sudden attack had thrown the court of Vienna was increased by doubts as to the intentions of France. These doubts were soon resolved by the latter, in the spring of 1741, forming a confederacy of all the claimants to the Austrian dominions—the electors of Bavaria and Saxony, sons-in-law of the Emperor Joseph I.; Philip V. of Spain; Charles-Emanuel of Sardinia, who claimed the Milanese; and Frederick II. of Prussia, who *now* demanded almost the whole of Silesia. On the other hand, Britain granted Maria Theresa an annual subsidy of £300,000; the Dutch were willing to aid her when opportunity offered; and Hungary gallantly responded to her pathetic appeal by sending in thousands her motley population, Magyars, Croats, Slavs, and Tolpatches, to fight in defence of their heroic queen. Meantime the Bavarians, in conjunction with the French under Belleisle, overran the greater part of Bohemia. This invasion compelled the queen to buy off her most formidable opponent, Prussia, by the surrender of Silesia and Glatz; and then, while Prince Charles of Lorraine kept the French at bay in Bohemia, Khevenhuller, the most enterprising of the Austrian generals, advanced up the valley of the Danube, captured 12,000 French in Lintz, overran Bavaria, and on the very day of the elector's coronation as the Emperor Charles VII., took Munich his capital (12th February 1742). But this great success alarmed Frederick II. for the security of his new possessions, and abruptly breaking the treaty, he poured his forces into Bohemia and Upper Austria, and gained the battle of Chotusitz (17th May). The same year witnessed increased activity on the part of Britain (the Walpole administration being now in power) and Holland on behalf of Austria; the expulsion of the French and Bavarians from Bohemia; the severance of the king of Sardinia from the coalition against Austria, produced by the bribe of some districts of the Milanese, which, however, he did not obtain till some time afterwards; the enforcement of neutrality upon Naples by the threatening attitude of a British fleet off the capital; and, on the other hand, the recovery of Bavaria by the elector.

In May 1743, Bavaria again fell into the hands of Prince Charles and Khevenhuller; Count Saxe was driven with great loss from the Palatinate; the 'Emperor' Charles-Albert and the Swedes, disgusted at their ill-success in the war, retired from the contest, so that France and Spain now remained the sole representatives of the once mighty coalition. In 1744, France and Britain, which had hitherto engaged in the conflict only as allies, declared war on each other; and the latter proceeded to destroy piecemeal the French and Spanish shipping on the high seas, and to attack their colonial possessions. For this, however, the successes of Saxe in the Netherlands were a compensation. However, the great successes of Austria on the Rhine, and the ill-concealed ambitious projects of Maria Theresa, again alarmed Frederick II. for Silesia; and he resolved on another attempt to rivet his hold on the much-coveted province before it was too late. Accordingly, he concluded at Frankfurt (May 13, 1744), a secret convention with France, the emperor, the elector-palatine, and the king of Sweden. Bursting into Bohemia with his usual celerity, Frederick II. forced the Austrians at once to return from Alsace, thus enabling the elector to recapture Bavaria; but before Prince Charles had time to reach Bohemia, a fresh levy of 44,000 men, which had been raised by the chivalrous and patriotic Hungarians, joined by 6000 Saxons, had reached the Prussians, and by cutting off their supplies, and capturing their stragglers and foraging parties, compelled them to evacuate the kingdom with considerable loss. In Italy, the Spaniards, who were now joined by the Neapolitans, were defeated repeatedly, and compelled to retreat down the peninsula; and the king of Sardinia succeeded in preventing the French from effecting a permanent lodgment in North-west Italy. In January 1745, the emperor-elector died, and his son, Maximilian-Joseph, profiting from his father's misfortunes, declined to take part in the contest, or to allow himself to be nominated emperor, and made peace with Austria. Frederick II., displeased with the meddling and overbearing conduct of France

with respect to the approaching imperial election, also sought to come to terms with Austria, by the mediation of Britain, and the peace of Dresden (25th December 1745) finally withdrew Prussia from the conflict. In Flanders, the fortunes of Austria also declined; and after the victory of Fontenoy (11th May 1745) she could not prevent Saxe from capturing the chief Belgian fortresses in succession. In Italy, also, fortune declared for the coalition; for the Spanish-Neapolitan army, now reinforced by the Genoese and Modenese—70,000 men in all—defied all opposition, overran the whole of Lombardy and much of the Sardinian territories, driving the king under the walls of his capital. Similar reverses befel the allies in Flanders during the campaign of 1746; but these were more than counterbalanced by the great successes obtained in Italy, where all the lost fortresses of Lombardy, Parma, and Guastalla, were recaptured, the coalition army totally routed in a great battle near Placentia (June 16), and Genoa overrun and occupied. Another of fortune's favours to Austria was the death of Philip V. of Spain (July 9), which, by depriving that arch-plotter, his queen, of the supreme power, considerably diminished the zeal of the Spanish court in the prosecution of the war. In 1747, the Dutch, who had hitherto escaped the ravages of war, were made practically acquainted with them by Saxe, who, having completely subdued the Austrian Netherlands, invaded and overran Dutch Flanders, routed the unfortunate Duke of Cumberland at Laffeldt (2d July), while his celebrated chief of engineers, Count Lowendal, after a two months' siege, took Bergen-op-Zoom, Cohorn's masterpiece, a fortress believed by the Dutch to be impregnable. At the commencement of 1748, Britain, France, and Holland sought to bring about a peace, and agreed among themselves to certain preliminaries, which were submitted to Austria and Sardinia; but as one of them was the surrender of Parma and Placentia to Don Philip of Spain, the former refused her consent; and her two allies, disgusted at her disregard of the sacrifices they had made on her behalf, at once signed the preliminaries (30th April), and Austria sullenly followed suit on May 18. Much discussion followed, but on the 18th October 1748, the treaty of Aix-la-Chapelle (q. v.) put an end to this most disastrous war, which left the Hapsburgs in possession of their hereditary dominions, with the exception of Silesia and some of their Italian provinces. See AIX-LA-CHAPELLE.

SUCCI'NIC ACID ($C_4H_6O_4$) derives its name from its having been originally found in amber (Lat. *succinum*), and is one of the group of dibasic acids of the oxalic acid series, whose general formula is $C_nH_{(2n-2)}O_4$. Succinic acid occurs as a natural constituent not only in amber, but also in the resins of many of the pine tribe, in the leaves of the lettuce and wormwood; and, in the animal kingdom, it has been detected in the fluids of hydatid cysts and hydrocele, in the parenchymatous juices of the thymus gland of the calf, and of the pancreas and thyroid gland of the ox.

One of the most important points in connection with succinic acid is its convertibility into tartaric acid, while tartaric acid may in its turn be reconverted into succinic acid.

SU'CCULENT PLANTS are those plants remarkable for the thick and fleshy or succulent character of their stems and leaves. This character prevails in the natural orders *Cactaceæ*, *Mesembryaceæ*, and *Crassulaceæ*, but frequently appears also in genera of other natural orders, as in aloes and some other *Liliaceæ*. It consists in a peculiar development of cellular tissue. Succulent plants are remarkable for the small number of Stomata (q. v.) on the green surface. They are generally found in dry climates, often as almost the only vegetation of the most arid places; although some of them occur in situations where moisture is often abundant; their peculiar structure, however, being apparently intended to adapt them for enduring occasional droughts. Thus, there are not only succulent plants in the Sahara and other deserts, but in Britain, and some of them form a conspicuous feature of the flora of the mountains of Europe—as species of *Sedum*, *Rhodiola rosea*, &c.—where they are found in situations sometimes abounding in moisture, but occasionally parched—on bare rocks, steep slopes with scanty soil, and the like. By the want of stomata and the store of moisture in their own cellular tissue, they are adapted for the endurance of long droughts. Yet they live in great part by nourishment derived from the atmosphere, rather than from the soil; a fact which may easily be proved by suspending a specimen of the Common Yellow Stonecrop (*Sedum acre*) by means of a string, when it will be found to flourish for a considerable time, and sometimes to preserve its vitality as long as those planted in the ground. In dry tropical countries, succulent plants perform in part the same office which lichens and mosses do in colder regions, in preparing the first mould for future vegetation.

SUCHET, LOUIS-GABRIEL, Duke of Albufera, and Marshal of France, was descended from an honourable family, and born at Lyon, 2d March 1770. He volunteered as a private into the cavalry of the Lyon national guard in 1792, and subsequently became attached to the army of Italy. His rare intelligence and brilliant valour, displayed at Lodi, Rivoli, Castiglione, Arcola, and in numerous battles of less note, laid the foundation of his military reputation, and in 1798 he became general of brigade. The able manner in which he, with a force not one-sixth of that of the Austrians, kept Melas in check (1800), preventing the invasion of the south of France, and ultimately capturing 15,000 prisoners, is one of the most brilliant military feats on record. S. also took a distinguished part in the campaigns against Austria (1805) and Prussia (1806), and was subsequently (April 1809) appointed generalissimo of the French army in Aragon, where, for the first time, he appears as holding an independent command. The part of Spain committed to his charge, though inhabited by a people distinguished by their obstinacy and patriotism above all others in Spain, was completely subdued, more, however, through his just and able administration, and the strict discipline which he maintained, than by military talent. The latter quality he was only called upon to exercise against Spanish troops, which he had little difficulty in annihilating. In the first few days of 1812, he conquered Valencia, and obtained in addition to his dignity of Marshal (8th July 1811) that of Duke of Albufera, and the grant of a magnificent domain. The five campaigns which he made in the Peninsula are considered perfect models of the kind of service he had to perform—viz., to rivet the chains of a foreign domination on the necks of a patriotic and high-spirited people. The details have been well given by him in his *Mémoires sur ses Campagnes en Espagne* (Paris, 1829, 1834, 2 vols. with atlas). But the misfortunes of the other French armies in Spain compelled S. gradually to relinquish all his conquests. He was created a peer by Louis XVIII., but took service under his old master after his return from Elba, and was charged with the defence of the south-west frontier. Deprived of his peerage at the second restoration, he did not return to court till 1819, when it was restored, and he soon rose high in royal

favour. He died at the château of Saint-Joseph, near Marseille, 3d January 1826. Napoleon's high opinion of S.'s military talents is recorded by O'Meara and Las Casas, and according to his classification, S. ranked second, Massena being first.—His son and successor in the dukedom of Albufera is a member of the Corps Legislatif, and a supporter of the Napoleonist policy.

SUCKING FISH, a name sometimes given to the Remora (q. v.), and to fishes of the family Discoboli (q. v.), which have a sucker formed by the union of the ventral fins, and are capable of attaching themselves by it to stones or other substances. The best known of the British species, and the only one which is of any value as an article of food, is the Lumpsucker (q. v.). Several other species occur on the British coasts, to which the name SUCKER is generally given, as the CORNISH SUCKER (*Lepidogaster Cornubiensis*), and the UNCTUOUS SUCKER or Sea-snail (*Liparis vulgaris*). They are small fishes, destitute of scales.

SUCKLING, SIR JOHN, one of the brilliant cavalier poets of the court of Charles I., was born at Whitton, in Middlesex, and baptised February 10, 1608—1609. His father, also a knight, held office as a secretary of state, and comptroller of the household, but died in 1627, when the poet was in his 18th year. The latter inherited large estates; and having completed his education at Trinity College, Cambridge, he went abroad, and served for some time in Germany under Gustavus Adolphus. He returned about 1632, and was soon distinguished for his wit, gallantry, and lavish expenditure. To aid the king against the Scots, he raised a troop of 100 horsemen, whom he clad in a rich and gaudy uniform of white and red, with plumes of red feathers in their caps. This loyal corps is said to have cost the poet about £12,000. They rode north; but no sooner had the cavalry come within sight of the Scots army at Dunse, than they turned and fled without aiming a blow! This disgrace gave occasion to numerous lampoons, and to a clever though coarse ballad against S.'s gay horsemen; but in reality they behaved no worse than the rest of the English army. Their loyal commander next joined in a scheme to rescue Strafford from the Tower, and this being discovered, he fled for safety to the continent. He died, while yet in the flower of his life and genius, in 1641 or 1642. Various accounts are given of the circumstances attending his death, but the most painful of these, viz., that he poisoned himself in Paris, is confirmed by family tradition. See the Memoir by the Rev. Alfred Suckling (1836), prefixed to a volume of *Selections from the Works of Sir John Suckling*. He had probably run through his fortune, and dreaded want, as well as despaired of the success of the royal arms. The works of S. consist of four plays, now utterly forgotten, a prose treatise entitled *An Account of Religion by Reason*; a collection of *Letters*, written in a stiff, artificial style; and a series of miscellaneous poems, beginning with *A Session of the Poets*, published in 1637, which is original in style, and happily descriptive of the author's contemporaries. But the fame of S. rests on his songs and ballads, which are inimitable for their ease, gaiety, and pure poetic diction. A few pages of amatory lyrics have embalmed his name for all posterity. His ballad of *The Wedding* is still unsurpassed, and one simile in his description of the bride—

> Her feet beneath her petticoat,
> Like little mice, stole in and out,
> As if they feared the light—

has had the honour of being copied by Herrick and Congreve.

SUCTO'RIA, an order of insects, containing only those which formed the Linnæan genus *Pulex*. See FLEA.

SUDA'MINA, or **MILIARY ERUPTION**, is one of the diseases of the skin belonging to the class *vesiculæ*, or *vesicles*. The former name is derived from the fact, that the disorder is always accompanied with profuse sweating; while the latter has reference to the size of the vesicles, which do not exceed those of a millet-seed. The vesicles are most abundant on the neck and trunk, and are sometimes, but not always, attended with itching. They almost always occur in association with febrile disorders, which, however, do not seem in any way modified by these occurrences. The only known condition that favours their production is copious and prolonged sweating. They sometimes appear in health during the summer heat, when strong exercise has induced copious sweating. Pathologically, this disease is of so little importance that it is unnecessary to notice its treatment. It is, however, sometimes useful as a sign in diagnosis, especially in typhus and typhoid fevers.

SUDA'N, or **SOUDAN**, a vast tract of Central Africa, bounded on the N. by the Sahara; on the W. by Senegambia; on the S. by Upper Guinea, from which it is separated by the Kong Mountains; and on the E. by Kordofan. The Kong Mountains rise to the height of 3000 feet; while Mount Atlantika, near the sources of the Chadda, is 10,000 feet in height. The Niger (q. v.) waters the western regions, and in the east are Lakes Tchad and Fittri. The climate of the west and middle districts resembles that of Senegambia and Guinea; that of Eastern S. is still imperfectly known. Agriculture is pursued with considerable skill; cotton, tobacco, and indigo are abundantly grown; and wheat, rice, maize, Guinea-corn, and millet are among the ordinary crops. Gold-dust, which abounds in the rivers; iron, made from iron-stone, which prevails in all parts of the country; and ivory and feathers, are the principal exports. Of the numerous kingdoms and states into which the country is divided, the following are the chief: Bambara, Masina, Gando, Sókoto, Bornu, Bagirmi, Waday, and Dar-fur. The area is not known, but is generally estimated at 2,250,000 sq. m.; the pop. at from 10,000,000 to 50,000,000. S. has for many ages been the peculiar home of the negro race.

SU'DBURY, a municipal borough of Suffolk, 16 miles south of Bury St Edmunds, on the left bank of the Stour, across which a bridge connects the town with the suburb of Ballingdon in Essex, forming part of the borough. The silk and bunting manufactures are the most important branches of industry. There are also extensive brick-works, in which the white clay used is notable for its purity. Malting is extensively carried on. S. was one of the first towns into which the woollen manufacture was introduced by the Flemings. Pop. (1881) 6584.

SUDDEN DEATH may be induced by natural or by violent causes, and the detection of the true cause is obviously of very great importance, since the acquittal or conviction of a suspected person may depend upon it. Sudden death may occur naturally from syncope (fainting or swooning), from asphyxia (literally pulselessness), or, more correctly, apnæa (privation of breath), or from coma (insensibility). Syncope, or sudden cessation of the heart's action, may occur, as Dr C. J. B. Williams points out in his *Principles of Medicine*, in two ways. (1.) By the heart losing its irritability (or becoming paralysed), so that it ceases to contract; and (2.) By its being affected with tonic spasm, in which it remains rigidly contracted, losing its usual alternation of

relaxation. Sudden death from asphyxia, or, more correctly, from apnœa, occurs when, from any cause, the entrance of air into the lungs is prevented. It is not so often witnessed as a result of disease as of accident. It is sometimes caused by a spasmodic closure of the chink of the glottis (see LARYNX). Sudden death from coma is liable to occur in apoplexy and injuries of the head.

In all cases of sudden death, there is a strong tendency on the part of the public to suspect poisoning. It is very hard to make them understand that persons may die a natural death suddenly as well as slowly; or conversely, that death may really take place slowly, and yet be the result of poison. 'One of the means,' says Dr Taylor, 'recommended for distinguishing narcotic poisoning from apoplexy or disease of the heart, is the difference in the rapidity with which death takes place. Thus, apoplexy or disease of the heart may prove fatal either instantly or within an hour. The only poisons likely to operate with such fatal rapidity are prussic acid or nicotina. Poisoning by opium is commonly protracted for five or six hours. This poison has never been known to destroy life instantaneously or within a few minutes. Thus, then, it may happen that death will occur with such rapidity as to render it impossible, under the circumstances, to attribute it to narcotic poison.'—*Op. cit.*, p. 145.

In its relations to medicine and medical jurisprudence, the subject of this article has been fully discussed by Herrick and Popp, *Der plötzliche Tod aus inneren Ursachen*, 1848.

SU'DETENGEBI'RGE, the most important mountain-range of Germany, dividing Prussian Silesia and Lausitz from Bohemia and Moravia, and connecting the Carpathians with the mountains of Franconia. It does not form a continuous chain except in the middle, where it is known under the names of Riesengebirge (q. v.) and Isergebirge; the ends, both towards the north-west and south-east, broadening out into great rugged hilly plateaux, with broken chains and isolated peaks. The S. are composed chiefly of granite, gneiss, mica-schist, and porphyry, with superimposed beds of basalt and coal, and are clothed with pines to a height of between 2000 and 3000 feet. They are rich in minerals, especially in the metals, iron, lead, copper, zinc, tin, cobalt, with some silver and gold. Schneekoppe (Snow-Peak) in the Riesengebirge, about 5000 feet high, is the culminating point in the whole range.—The name S. is applied in a narrower sense to the south-east portion of the range, separating Silesia from Moravia.

SÛDRA is the name of the fourth caste of the Hindus. See CASTE.

SUE, MARIE-JOSEPH-EUGÈNE, a well-known French novelist, was born at Paris, 10th December 1804. His father, Jean-Joseph Sue, was one of the household physicians of Napoleon, and he educated his son for his own profession. At the age of twenty the young man became an army surgeon. In this capacity he served in the French expedition to Spain, under the Duke of Angoulême in 1823. Subsequently he transferred himself to the navy; and in 1828, was present at the battle of Navarino. In 1829 his father died, leaving him a handsome fortune, on the acquisition of which he ceased to practise his profession. After coquetting a little with art he betook himself seriously to literature, and very soon, in the department of fiction, he achieved a considerable popularity. His earlier efforts were sea-stories, somewhat after the manner of Cooper, or romances in imitation of Scott; and though in both fields he displayed talent, his true power was scarcely as yet developed. Something of it may, however, be traced in his *Mathilde, ou les Mémoires d'une Jeune Femme*, published in 1841; but it was first decisively made manifest in the famous *Mystères de Paris*, which began to appear the year after in the columns of the *Journal des Débats*. The furor of excitement occasioned by this work and its successor, *Le Juif Errant*, which appeared in the *Constitutionnel*, not only in France but elsewhere, has seldom, perhaps, been exceeded; and for both the writer received large sums of money. In 1846, his *Martin, l'Enfant Trouvé* was issued; in 1847—1848 appeared *Les Sept Péchées Capitaux;* and in 1852, he published *Les Mystères du Peuple*, his last work of any importance. Throughout Sue's later works there runs a vein of socialism; and at the revolution of 1848 he allied himself with the extremest sect of the Republicans. On 28th April 1850 he was elected deputy to the Legislative Assembly for the department of the Seine, and was assiduous in his duties as such till the *coup d'état* of December 1852, by which he was driven into exile. He retired to Savoy; and at Annecy he died 3d July 1857.

In the writings of Sue great power is displayed; but it is rather of the unhealthy kind, and depends for much of its effect on vicious sources of interest. His books are read once with a fever-heat of curiosity, and scarcely bear reperusal.

SUE'CA, a town of Spain, in Valencia, and 23 miles south of the city of that name, on the Jucar, about 4 miles from the Mediterranean. Brick and tile works are in operation, and there are several flour and rice mills. Pop. over 8000.

SU'ET is a variety of solid fatty tissue, which accumulates in considerable quantity about the kidneys, and the omentum of several domestic animals, especially the ox and sheep. Beef suet is extensively used in cookery, while purified mutton suet under the name of *Sevum Præparatum* occurs in the Pharmacopœia, and is obtained by melting and straining the internal abdominal fat. It consists of a mixture of the ordinary animal fats, with a great preponderance of the most solid of them; viz., stearin, which constitutes about three-fourths of the whole. The pure suet of the Pharmacopœia is 'white, soft, smooth, almost scentless; and is fusible at 103°.' It is used as an ingredient in cerates, plasters, and ointments. Ordinary melted suet is frequently employed in the same manner as lard, to preserve potted meats or fish and similar articles from the action of the air.

SUETO'NIUS, CAIUS TRANQUILLUS, son of Suetonius Lenis, a tribune of the 13th legion under Otho, was born probably a few years after the death of Nero. He is known to us chiefly as a Roman historian and miscellaneous writer, for his merits as which he is highly praised by the Younger Pliny. He was also, it is supposed, a teacher of grammar and rhetoric, and a composer of exercises in pleading; nay, from a letter of Pliny's to him, it may be gathered that he sometimes pleaded causes in person. Pliny procured him the dignity of military tribune, which, by S.'s desire, he got transferred to another. Though childless, S. was, through the same friendly agency, presented by Trajan with the *jus trium liberorum*, which, in that reign, was only to be had by great interest. He was afterwards secretary of the Emperor Adrian, whose favour he had secured. The date of his death is unknown. All his works (among which, as we learn from Suidas, there were several on topics usually treated by grammarians) have been lost, except his *Lives of the Cæsars*, his *Lives of Eminent Grammarians*, and (in part only) his *Lives of Eminent Rhetoricians*. It is by the first of these works

that he is most favourably known, replete as it is with information about the Twelve Cæsars, from C. Julius to Domitian, which is to be had nowhere else, and abounding with anecdotes which, while they too often prove the profligacy of his heroes, testify to the impartiality of their chronicler. From a period long before the renaissance to the present, these 'Lives' have always been favourite reading, and have found numerous editors, the best of whom is still Burmann (Amsterdam, 1736), and numerous translators into nearly every European language.

SUE'VI, first mentioned by Cæsar, in whose history (*De Bello Gallico*) the name is employed as the collective designation of a great number of Germanic peoples. They occupied a district of indefinite extent on the eastern side of the Rhine, and may have been the same tribes as those subsequently known as Chatti, Longobardi, &c. Cæsar states that their territory comprised 100 cantons, and was densely wooded, that they had towns (*oppida*), but no strongholds, and that every year a part of the population left their homes to seek employment in war. The S. of whom Tacitus speaks (*Germania*, 38, &c.) seem to have dwelt north and east of the S. of Cæsar, extending as far as the Elbe and the Baltic, which Tacitus calls the 'Suevic Sea.' The peoples united under the rule of Maroboduus, the Marcomannic chief, were Suevic, and hence the Marcomanni and Quadi, who figure in the reigns of Marcus Aurelius and Aurelian, are often called Suevi. After the name had fallen into disuse as a collective designation, it reappeared (second half of the 3d c., *Amm. Marc.*, &c.) as the name of a people occupying the same territory as the S. of Cæsar, who appear, however, to have been a mixed race made up of adventurers from different parts of Germany, and who probably took the name of S. after possessing themselves of the country. We find them in alliance with the Burgundians, Alemanni, Alani, Vandals, &c. They are among the most notable of the barbaric peoples that broke up the Roman Empire in the north-west and west. Bursting through the passes of the Pyrenees (409 A. D.), they, along with the Vandals, overran and wasted Spain (q. v.). Those who remained at home in Germany seem to have spread during the 5th c. east to the Neckar and the Rauhe Alps, and south as far as Switzerland. The medieval Swabians were their direct descendants.

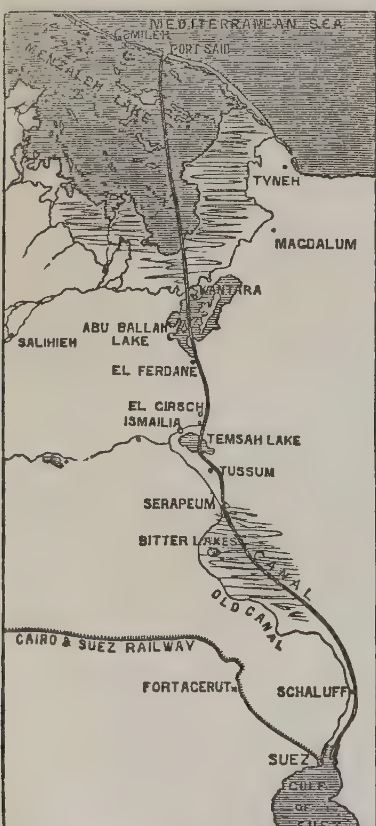
SU'EZ, until recently, a small, ill-built, wretched-looking town, on an angle of land near the northern extremity of the Gulf of Suez, 76 miles east of Cairo, with which it is connected by railway. Pop. variously estimated at from 1500 to 8000. It is walled on all sides but that towards the sea, has an indifferent harbour, but a tolerably good quay. S. of late has been greatly improved. English and French houses, offices, and warehouses have been erected in every direction, and the bazaars are assuming a respectable appearance. These bazaars are provided with clarified butter from Sinai, with fowls, grain, and vegetables from the Egyptian province of Sharkijeh, and with wood, dates, and cotton. Rain falls but seldom, sometimes not once in three years. All around stretches a burning waste of sands. S. owes its modern prosperity to the establishment of what is known as the *Overland Route* (q. v.) to India, in consequence of which a large portion of the traffic between England (and other European countries) and the East passes through the place. For a long time previous to the establishment of this route, S. had been in a state of complete decay, although, at a yet earlier period—previous, in fact, to the discovery of the sea-route to India by the Cape of Good Hope—it was a flourishing emporium of the products of East and West. The improvement that has recently taken place is partly owing to the works for the Suez Canal and the fresh-water canal carried to the town by the French, and partly to the enormous increase of traffic by the overland route.

The GULF OF SUEZ is the western and larger of the two branches into which the Red Sea divides towards its northern extremity, and washes on the west the coasts of Egypt, on the east those of the Sinaitic peninsula. Extreme length, 200 miles; average breadth, about 20 miles. The shores are sometimes low, barren, and sandy wastes, sometimes bold and rocky headlands.

The ISTHMUS OF SUEZ is a neck of land 72 miles in width at its narrowest part, extending from the Gulf of Suez on the south to the Mediterranean on the north, and connecting the continents of Asia and Africa. It embraces within its limits (according to the commonly received opinion) the fertile Goshen (q. v.) of antiquity; but it is now a wretched uninhabitable waste, consisting of mingled sand and sandstone, interrupted here and there with salt swamps or lakes, but almost entirely destitute of fresh water. The main interest, however, attaching to this region is a commercial one—viz., whether or not—since Egypt is on the great highway to India and China—it is practicable to cut a ship-canal through the isthmus. Without pronouncing positively on the point, we shall endeavour to give our readers a brief account of the state of the question.

It is certain that, in ancient times, a canal connecting (indirectly) the two seas did exist. At what period it was constructed is not so certain. Herodotus ascribes its projection and partial execution to Pharaoh Necho (about 600 years B.C.); Aristotle, Strabo, and Pliny less felicitously fix on the half-mythical Sesostris as its originator. The honour of its completion is assigned by some to Darius, king of Persia, by others to the Ptolemies. It began at about a mile and a half from Suez, and was carried in a north-westerly direction, through a remarkable series of natural depressions, to Bubastis, on the Pelusiac or eastern branch of the Nile. Its entire length was 92 miles (of which upwards of 60 were cut by human labour), its width from 108 to 165 feet, and its depth 15 (Pliny says 30) feet. How long it continued to be used, we cannot tell; but at length it became choked up with sand, was restored by Trajan early in the 2d c. A.D., but again became unusable from the same cause, and so remained till the conquest of Egypt by Amrou, the Arab general of the calif Omar, who caused it to be reopened, and named it the 'Canal of the Prince of the Faithful,' under which designation it continued to be employed for upwards of a century, but was finally blocked up by the unconquerable sands, 767 A.D. In this condition it has ever since remained. The attention of Europe was first turned to it in modern times during the invasion of Egypt by Bonaparte, who caused the isthmus to be surveyed by a body of engineers, who arrived at the opinion that the level of the Mediterranean is 30 feet below that of the Red Sea at S., an opinion which a subsequent survey proved to be erroneous. From this time, the question continued to be agitated at intervals, especially by the French, and various plans were proposed, but nothing definite was arrived at till 1847, when France, England, and Austria sent out a commission to measure accurately the levels of the two seas. The commissioners, M. Talabot, Mr Robert Stephenson, and Signor Nigrelli, ascertained that, instead of a difference of 30 feet, the two seas have *exactly the same mean level*. The only noticeable difference was, that there is a tide of 6½ feet at

the one end and 1½ feet at the other. Another examination leading to similar results was made in 1853. Mr Stephenson expressed himself very strongly against the feasibility of a canal, that is to say, a canal of such dimensions as would suit the requirements of modern commerce, and planned, instead, a railway from Cairo to S., which was opened (1858), and has since conveyed overland the British, Indian, and Australian mails. The French, however, were not satisfied with Mr Stephenson's conclusions, and M. Talabot, on his return to Europe, published in the *Revue des Deux Mondes* a plan for connecting the two seas by way of Alexandria and S. (or rather a point 6 miles below S.), for a description of which we have not space. In 1854, a new experimenter appeared in the person of M. de Lesseps, a member of the French diplomatic service in Egypt, who (1856) obtained from the pasha the 'concession,' i. e., the exclusive privilege, of forming a ship-canal from Tyneh (near the ruins of ancient Pelusium) to Suez. The peculiarity of M. de Lesseps's plan lay in this, that, instead of following an oblique course, and uniting his canal with the Nile, as the ancients had done, and as all the modern engineers had thought of doing, he proposed to cut a canal right through the isthmus in a straight line to Suez. This canal was to be 328 feet wide, and 100 miles



Map shewing Suez Canal.

long; the bottom to be 26½ feet under low-water mark, and 72.2 feet in breadth, and at each end there was to be a sluice-lock 328 feet long by 70 feet wide. By taking advantage of the tides at S., it was hoped that an additional depth of 3 or 4 feet might be obtained. But the colossal feature of M. de Lesseps's plan was the artificial harbours which he proposed to execute at the two ends, Tyneh and Suez. That at the Mediterranean end was to be carried out 5 miles in order to obtain a permanent depth of water for a ship drawing 23 feet, on account of the enormous quantity of mud-sand which the Nile annually pours out (30,000,000 cubic yards, it is said), and which the prevalent wind drives eastward along the shore towards the southern coast of Palestine. The quantity of stone required to construct this harbour has been calculated variously at from 3 to 12 million cubic yards, and there are no stone quarries except at a great distance from Tyneh! The pier at S. was to be carried out 3 miles, and in other respects the difficulties, though great, were not, as on the Mediterranean coast, *almost* insurmountable. The English, for political, perhaps, as well as for practical reasons, looked with aversion on M. de Lesseps's scheme; but in 1855, the question was again taken up in an international spirit, a new European commission was appointed, which reported that M. de Lesseps's scheme, somewhat modified, *was practicable*, and that a canal might profitably be constructed. The result of the report was the formation of a company, and after four years' work the canal, which has its Mediterranean entrance at Port Said, about the middle of the narrow neck of land between Lake Menzaleh and the sea, in the eastern part of the Delta, was completed. The canal was dredged through this lake, which runs far into the land directly towards S., and is connected with Lake Temsah, the Bitter Lakes, and other marshy swamps, and so with Suez. As early as December, 1864, the Mediterranean and the Red Sea had been connected. The communication, however, was not throughout by the permanent maritime canal, but simply by a fresh-water canal of no great width or depth. On the 18th of March, 1869, the waters of the Mediterranean were admitted into the Bitter Lakes with complete success, and in September a steamer made the passage along the entire length of the canal, and it was formally announced that the work would be opened on the 17th of November. The preliminaries commenced on the 15th, when the Emperor of Austria landed at Port Said. On the 16th the Empress Eugenie arrived, and on the 17th the French imperial yacht Aigle, followed by 40 vessels, anchored at Ismaïlia, having passed through the first part of the Suez canal in 8½ hours, and was here met by 4 steamers from Suez, the southern terminus of the canal; on the 19th of Nov. the fleet of steamers sailed for Suez, and on the 21st arrived at the Red Sea. The water was 20 feet deep at the shallowest part, and generally not less than 25 feet. The canal is open to vessels of all nations, and the transit can be made in 15 hours. It has cost about $60,000,000. From the day of its opening to June 30th, 1870, 7½ months, 393 ships had passed through the canal, 233 of which, with a tonnage of 195,428, paid £129,784 for tolls. For a description of the method by which the Suez canal was excavated, &c., see *Rep. of Commissioners to the Paris Exhibition*, vol. iv., by W. P. Blake, Washington, 1870. See also article SUEZ CANAL, in the *Supplement* to this work, in Vol. X.

SUFFOCA'TION. See ASPHYXIA and RESPIRATION.

SU'FFOLK, a maritime county of England bounded on the E. by the German Ocean, on the N. by Norfolk, and on the S. by Essex. Area 947,681 acres; pop. (1881) 356,863. The surface is for the most part flat, falling away into marshes on the north-west and north-east borders. The coastline, which is low and marshy, or lined with cliffs of shingle or gravel and red loam, is about 50 miles

in length, and is, on the whole, regular, being unbroken by any considerable indentation, and comprising no headland worthy of notice except Lowestoft Ness, the most easterly point in Great Britain. The tributaries of the Waveney, which separates S. from Norfolk on the north, and those of the Stour, which forms the boundary-line on the south, together with the river Lark, an affluent of the Great Ouse, and the Gipping, which, after it begins to broaden into an estuary, is called the Orwell, are the chief streams. The climate is cold in spring, but is drier than that of the western counties. The soil is of various kinds, some of which are very productive. 820,000 acres are under cultivation, and the most improved system of agriculture has been introduced, together with the best and newest agricultural implements. A polled breed of cattle, of which the cows are deservedly held in high esteem, is peculiar to the county. The S. pigs are a famous and most profitable breed. There are in the county about 500,000 head of sheep, chiefly Southdowns and crosses of this breed. The ordinary crops are raised. The county sends four members to parliament. Capital, Bury St Edmunds.

SU'FFRAGAN (Lat. *suffraganeus*, from *suffragium*, a suffrage or vote), the name given to a bishop in a province, in his relation of dependence or subordination to the archbishop, or rather metropolitan, of the province. See METROPOLITAN. In some continental churches, the name is applied to coadjutor-bishops appointed—as in the case of prince-bishops in the German Empire—to assist the bishop in his own diocese.

SU'FFRAGE (Lat. *suffragium*, derivation uncertain), a right to vote, and more particularly the right possessed by the citizen of a state where representative government exists, to vote for a member of the legislative body.

The idea that the universal enjoyment of political suffrage is a right by natural law, is grounded on the fiction, that the obligations of municipal law arise out of a social contract express or implied. In opposition to this notion, it is argued that the true purpose for which government exists is the general welfare of the nation; and it is the duty of the state to consider whether the suffrage may be more beneficially exercised by the many or the few. Infants, minors, idiots, and insane persons have everywhere been excluded from the suffrage, on the ground that sound judgment is necessary for its exercise. Persons convicted of crimes have been excluded, as a security to society; and also almost universally women, for reasons based on their relation to society and to the opposite sex. Like considerations of expediency, it is argued, are a ground for withholding the suffrage from those whose circumstances and station in life render it unlikely that they should form a sound judgment on political questions. It is the intelligence and enlightenment of the country that an elective legislature should represent; and in any large extension of the suffrage, there is obviously a risk of the intelligence of a constituency being swamped by its mere numerical majority. A widely extended suffrage has, however, been advocated as a valuable means of educating the people to self-dependence; and several philosophical politicians of the present day, who are favourable to a large extension of the electoral qualification, propose to obviate what they regard as its otherwise inevitable evils, by graduating the suffrage, so as to give each individual elector a number of votes corresponding as much as possible to his property, education, or social position. Schemes for this end, differing in detail, have been proposed by Mr J. Stuart Mill, in his *Considerations on Representative Government* (1861); and by Professor Lorimer in his *Political Progress not necessarily Democratic* (1857), and *Constitutionalism of the Future* (1865). See REFORM, REPRESENTATION, BALLOT.

SU'FISM (from *sufi* or *sofi*, the Greek *sophos*, a sage; erroneously also derived from Arab. *sof* or *suf*, wool, and thus designating an individual who wears nothing but woollen garments) designates a certain mystic system of philosophical theology within Islam. Its devotees form a kind of ecclesiastical order somewhat similar to that of the Fakirs (q. v.), or dervishes, but they are mostly of a far superior stamp; and some of the greatest Persian poets, philosophers, historians, and even kings belonged to their ranks. They assume four principal degrees of human perfection or sanctity. The first or lowest is that of the Shariat—i. e., of the strict obedience to all the ritual laws of Mohammedanism, such as prayer, fasting, pilgrimage, almsgiving, ablutions, &c., and the ethical precepts of honesty, love of truth, and the like. The second degree (Tarikat) is not attainable by all, but only by those higher minds that, while strictly adhering to the outward or ceremonial injunctions of religion, rise to an inward perception of the mental power and virtue necessary for the nearer approach to the divinity, the necessity of, and the yearning for, which they feel. The third (Hakikal = truth) is the degree of those who, by continuous contemplation and inner devotion, have risen to the true perception of the nature of the visible and the invisible—who, in fact, have recognised the Godhead, and through this knowledge of it have succeeded in establishing an ecstatic relation to it. This state is finally sublimated into that highest and last degree (Maarifal), in which man communicates directly with the Deity. Practically, the great mass of the people take the lowest degree; the second stage is reached by the 'Murides,' who do not fulfil the behests of the ceremonial law because they are behests, but because they are good in themselves, knowing that virtue is good; and because it leads to truth, they adhere to it for its own sake. They give alms because the sight of poverty grieves them; their ablutions are as much due to their desire of physical purity as to that of obeying a religious injunction. The third stage is that of the Naibs, to whom all this spiritualising of faith applies in a still more eminent degree. And the highest stage of attainable perfection is that of the Murshid, whose words are God's words, pure and simple, because he is in direct and constant communion with God. He is the 'Sun of faith,' by whose reflected light shine the Naibs, its 'moons.' All Sufistic poetry and parlance is to be taken allegorically and symbolically. They represent the highest things by human emblems and human passions; and religion being with them identical with love, erotic terminology is chiefly used to illustrate the relation of man to God. Thus the beloved one's curls indicate the mysteries of the Deity; sensuous pleasures, and chiefly intoxication, indicate the highest degree of divine love as ecstatic contemplation; while the wine-house, of which constant mention is made, merely indicates the state in consequence of which our human qualities merge in or are exalted into those of the Deity. Founded in the 9th c. by Kafi-Mullah, this peculiar mysticism has principally struck root in Persia, and chiefly among men of genius, e. g., Hafiz (q. v.). Recently, it has been revived, with slight modifications, by Shamil, the renowned and once formidable antagonist of the Russians, who undertook to enlist even the common soldiers, if not in the ranks of the

initiated—for Sufism, in its real meaning, is very exclusive—at least of its votaries; and the very lowest among them even had a sentence given him indicative of his forming part of the sect and of the gradations that form its main characteristics. In conclusion, it may be observed that Sufism mixes up all religions and all their prophets indiscriminately in one class; and the words idolatry, unbelief, licentiousness, and the like are generally used in their reverse sense by its votaries. Their principal religious writer is Jalaleddin Rumi (q. v.).

SUGAR (Lat. and Gr. *sacchar-*, Sans. *sarkara*, Pers. *schakar*, Arab. *sokkar* or *assokkar*, Sp. *azucar*, It. *zucchero*, Fr. *sucre*, Ger. *zucker*) is a general term applied by chemists to a number of neutral carbo-hydrates, possessing a more or less sweet taste, for the most part crystallisable, and produced by the vital processes going on in certain plants and animals. They are divisible into two groups, the first embracing such sugars as are capable of undergoing fermentation, and of being resolved, under the action of yeast, either directly or indirectly into alcohol and carbonic acid gas; and the second including those sugars which are not capable of being broken up by fermentation into the above-named products. The first group contains cane-sugar or sucrose, fructose or inverted sugar, trehalose, mycose, melezitose, melitose, grape-sugar or Glucose (q. v.), and milk-sugar or lactose; while the second group includes inosite or inosin, sorbite or sorbin, and scyllite or scyllin.

Cane-sugar or *saccharose* ($C_{12}H_{22}O_{11}$), the ordinary sugar of commerce, is by far the most important of this class of compounds; and in so far as its sweetening properties are concerned, it exceeds grape-sugar in the ratio of 5 to 2, and milk-sugar in a still higher ratio. It has a specific gravity of 1·6. It dissolves in about one-third of its own weight of cold water, producing a thick viscid syrup, and in all proportions in hot water; it is slightly soluble in absolute alcohol, but spirit of wine of specific gravity 0·830 dissolves about one-fourth of its weight. By the spontaneous evaporation of its watery solution, it is deposited in four-sided rhomboidal prisms. Common loaf-sugar and sugar-candy are two well-known forms of crystallised sugar; the former consisting of a mass of small transparent crystals, and owing its dazzling whiteness to the numerous reflections and refractions which the rays of light undergo within the interior from the numberless crystals of which it is composed; while the brown colour which the latter usually possesses is due to the colouring matter not having been removed from the syrup previous to crystallisation. The crystals of sugar-candy are larger than those of loaf-sugar, in consequence of the slower evaporation in the former case. When crystals of sugar—as, for example, two pieces of loaf-sugar—are rubbed together in the dark, a pale phosphorescent light is evolved. If a solution of sugar be boiled for a long time, it acquires an acid reaction, and loses its power of crystallising—a change which is attended by the assimilation of additional water, and the formation of the uncrystallisable inverted sugar which will be presently described. If the boiling be further prolonged, the inverted sugar ($C_6H_{12}O_6$) assimilates more water, and is converted into grape-sugar ($C_6H_{12}O_6 + 2Aq$), while a little formic acid and ulmin (a brown, nearly insoluble substance belonging to the *humus* group) are produced. The crystallisation of sugar is also prevented by the addition of a little oxalic, citric, malic, or any of the stronger acids to its solution; and in order to check the bad effects of an acid, a small quantity of lime is usually added to the cane-juice before it is heated.

The action of different degrees of heat on sugar has been carefully studied. At about 320°, sucrose fuses, and on cooling, forms the transparent amber-coloured solid known as *barley-sugar*, which, if kept for a long time, assumes a crystalline state, and becomes opaque. If the application of heat be continued until about 400°, the sugar loses two atoms of water, and *caramel*, which is described in the article GLUCOSE, is formed, and at a still higher temperature, the changes which sucrose undergoes are identical with those suffered by glucose. Sugar dissolves many metallic oxides when its solution is boiled with them—as, for example, freshly precipitated oxide of lead, lime, and baryta, and its presence prevents the precipitation of alkalies of various metallic oxides from their salts—the oxides of copper and of iron being thus retained in solution. Many metallic oxides are partially or entirely reduced when boiled with sugar; thus, chromic acid is reduced to sesquioxide of chromium, salts of the red oxide of mercury are converted into those of the suboxide, and salts of gold give a precipitate of the reduced metal. It does not reduce alkaline solutions of oxide of copper to the suboxide (Trommer's test) unless with the aid of heat, which converts it into glucose. Under the action of certain oxidising agents, it may be converted into propionic, formic, and acetic acids. Sucrose is not *directly* capable of undergoing fermentation; but in the presence of a ferment (yeast, for example) it is converted into glucose, and in that form it readily undergoes vinous, lactic, and butyric fermentation. Its action on polarised light is described below.

This variety of sugar is chiefly obtained from the juice of the sugar-cane, but it is also abundantly present in the juices of certain species of maple and of beet-root, all of which yield this substance as a commercial product; it is also contained in Sugar-grass (*Sorghum saccharatum*), whose juice yields 13 per cent. of sugar; in carrots and turnips, in the pumpkin, the chestnut, the young shoots of maize, in the flowering buds of the Cocos palm, and in a large number of tropical fruits. Its use as an article of diet has been already mentioned under DIET. Several articles of food contain some form of sugar in considerable quantity. In peas, there are 2 per cent. of sugar; in rye-meal and wheaten bread, about 3½ per cent.; in cows' milk, 4¾ per cent.; in goats' milk and in barley-meal, 5¼ per cent.; in human milk, in asses' milk, ripe gooseberries, and ripe pears, about 6 per cent.; in oatmeal, about 8 per cent.; in wheaten flour, from 4 to 8 per cent.; in beet-root, from 5 to 10 per cent.; in ripe peaches, 16½ per cent.; in ripe cherries, 18 per cent.; and in dried figs, upwards of 60 per cent. Although sugar is commonly regarded as a luxury, it is in reality a very valuable article of food (as, indeed, might be inferred from its presence in milk, and in both the yelk and white of eggs), since it is very rapidly digested, and supplies heat-forming or respiratory food to the system. 'When, however,' says Dr E. Smith, 'it is compared with wheaten flour, it is a very dear food, since three or four times more carbon will be obtained for 1*d.* in flour, besides nitrogen, none of which is found in sugar. It has also been proved by Messrs Lawes and Gilbert that even its fattening properties—that is to say, its power to form fat in the system, when it is supplied in excess of the quantity which the daily wants of the body require to produce heat—are not greater than those of starch as found in the cheapest grain.'—*Practical Dietary*, 1863, p. 63. In consequence of sugar being a fat-forming substance, it should be taken very sparingly in cases of excessive obesity. There are

certain forms of dyspepsia in which sugar should be avoided, as exciting increased gastric uneasiness; and in diabetes, all articles of food containing or (like starch) yielding sugar should be rigidly prohibited. Although prone to fermentation when in a diluted state, in its concentrated form sugar possesses great antiseptic power, and is extensively employed to preserve both vegetable and animal substances from decay. The sugar naturally existing in some fruits is often sufficient to insure their preservation in a dry state, while in other cases it is added, as in preserves and jellies. A mixture of salt and sugar applied to meat, fish, &c. preserves more of the natural flavour than mere salting does. Sugar converted into caramel is much used by cooks and confectioners as a colouring matter.

Closely allied in their chemical characters to sucrose are the following comparatively rare forms of sugar: (1) *Trehalose* ($C_{12}H_{22}O_{11} + 2Aq$), so called from *Trehala*, or Turkish Manna (the product of a coleopterous insect, *Larinus nidificans*), from which this variety of sugar is extracted, differs from sucrose in the following points—it crystallises in brilliant rectangular octahedra; contains water of crystallisation; fuses at 212°, and loses its water of crystallisation; is very soluble in hot alcohol; possesses about three times as great a rotatory power on polarised light; and when heated to 356° does not undergo further change. (2) *Mycose*, obtained from ergot of rye, possesses the same composition as trehalose, from which it mainly differs in crystallising in rhombic prisms, and in exhibiting a somewhat weaker rotatory power. (3) *Melezitose* ($C_{12}H_{22}O_{11}$), obtained from larch manna, differs from cane-sugar in its less sweet taste, and in exhibiting a less powerful rotatory action. (4) *Melitose* ($C_{12}H_{22}O_{12} + 3Aq$), the chief ingredient in the Australian manna yielded by the *Eucalyptus* tree, crystallises in acicular prisms, is feebly sweet, undergoes fermentation with yeast, but yields only half as much alcohol and carbonic acid as would be obtained from an equal weight of glucose, one half of this sugar being converted into an unfermentable syrupy body, known as *Eucalyn* ($C_6H_{12}O_6$).

More important than any of the above varieties, and differing from cane-sugar in a distinctive physical property, is the substance formerly known as *Fruit Sugar*, but now often described as *Inverted Cane-sugar*. The objection to the former name is, that the sugar contained in many ripe acidulous fruits, and formerly regarded as a distinct variety, is merely a mixture of dextrose ($C_6H_{12}O_6$) and lævulose ($C_6H_{12}O_6$), in equal proportions, which has already been noticed as resulting from the action of prolonged boiling, or of a little acid on cane-sugar. The same change occurs in many ripening fruits, in consequence of the presence of a peculiar albuminous ferment. Dextrose is not crystallisable, is soluble in dilute alcohol, and produces *right*-handed rotation; hence its name. By chemical means, cane-sugar is convertible into grape-sugar, a change which sometimes occurs spontaneously, as is seen in the gradual crystallisation of the sugar in dried fruits.

Grape-sugar, constituting the hard granular sweet masses occurring in old dried fruits, such as raisins, figs, &c., has already been described in the article GLUCOSE, or GLYCOSE, under which names it is commonly known to chemists. It is also known as *Starch-sugar*, because it is readily obtained by the action of a dilute acid on a hot solution of starch, and is identical with the sugar occurring in the urine in diabetes.

Milk-sugar, called also *Lactin* by Pasteur, and *Lactose* by Dumas, who has applied to it the formula $C_{12}H_{22}O_{11}$, is a purely animal product. It exists in considerable quantity in the milk, especially of the herbivorous animals, and is one of the most important and essential ingredients in that secretion. It may be obtained on a large scale by separating the curd from the milk, and evaporating the whey till it is ready to crystallise; when, on the introduction of small pieces of wood, the crystals of sugar are deposited on them. These crystals are four-sided prisms of a milk-white colour, and so hard that they crunch between the teeth. This variety of sugar is only moderately sweet (*vide supra*), requires about six times its weight of cold water for its solution, but dissolves readily in boiling water, while it is insoluble in alcohol or ether. If it be gradually heated to 284°, two equivalents of water are expelled, whereas, if it be suddenly heated to about 400°, all five equivalents are given off. When pure, milk-sugar is insusceptible of fermentation; but when boiled with dilute acids, it is converted into a directly fermentable sugar, in many respects very similar to grape-sugar, and to which some chemists have given the name of *Lactose*, a term commonly applied to milk-sugar itself. On treating a moderately diluted acid solution of milk-sugar with yeast, this variety is first formed, and then yields carbonic acid and alcohol; if, however, decomposing matters, as, for example, casein in the act of disintegration, are present, it undergoes lactic and butyric fermentation; and hence we understand how milk after exposure for a time to the air becomes sour. The intoxicating character of the drink prepared by the Kalmucks and Tartars from sour mares' milk, is due to this indirect vinous fermentation of sugar of milk. Regarding the uses of this variety of sugar, it may be observed that it is probably the most important of the constituents of whey (which is milk deprived of the whole of its casein except a mere trace held in solution), and hence that it is the active ingredient in the *whey-cure*, which is so popular in Switzerland. (The whey in these cases is usually obtained from goats' milk.) It is also the chief constituent of the globules used in homœopathy.

The second group of sugars, namely, those which are incapable either directly or indirectly of undergoing fermentation, are of less practical importance than cane-sugar, grape-sugar, or milk-sugar.

Inosin, or *Inosite* (derived from the Greek *is*, gen. *inos*, muscle), is represented by the formula $C_6H_{12}O_6$. It occurs as a normal constituent in the juice of the heart, and of the involuntary or unstriped muscles, and has also been found in the tissues of the lungs, spleen, liver, kidneys, and brain, and in the urine in Bright's disease and diabetes. It has been recently shewn that it is identical with the substance previously known as *Phaseo-mannite*, which is readily obtained from the unripe seeds of the common kidney-bean (*Phaseolus vulgaris*). It forms colourless efflorescent prisms, which lose four equivalents of water at about 210°. When mixed with decaying cheese and chalk, it becomes gradually converted into lactic and butyric acids. *Scyllite* is a saccharine matter closely resembling inosite, and occurring in various organs of several plagiostomous fishes, and especially in the kidneys of the rays and skate. It differs, however, from inosite in its crystalline form, and in its containing no water of crystallisation. Its composition is unknown. *Sorbin*, or *Sorbite* ($C_{12}H_6O_{12}$), derives its name from its occurring in the juice of the berries of *Sorbus aucuparia*, the Service Tree, and may be obtained in colourless transparent rhombic octahedra. It reduces oxide of copper to the suboxide (Trommer's test), and is of a sweetish taste.

Closely allied to the sugars, but differing from them in their chemical composition (inasmuch as they do not contain hydrogen and oxygen in the

proportions to form water), are *Mannite* ($C_6H_{14}O_6$), obtained from *Manna*, the inspissated juice of the *Fraxinus ornus*, but also occurring in celery, onions, asparagus shoots, *Laminaria saccharata* and other sea-weeds, certain fungi, the juice which exudes from apple and pear trees; *Dulcite* ($C_6H_{14}O_6$), the product of an unknown Madagascar tree; *Quercite* ($C_6H_{12}O_5$), obtained from acorns; and *Pinite* ($C_6H_{12}O_{10}$), from *Pinus lambertiana*, a tree growing in Australia and California. All these bodies are crystalline, and sweet to the taste.

Although chemists have hitherto looked upon the sugars as organic compounds, without any recognisable radical, and from their composition have termed them *carbo-hydrates*, 'the researches of Berthelot render it probable that the sugars as well as mannite, and the bodies allied to it, are polyatomic alcohols, like glycerine, for he has found that they possess the power of entering into combination with various acids, with elimination of water, in some cases yielding colligated acids analogous to the tannic, and in others furnishing neutral bodies closely allied to the fats.'—Miller's *Organic Chemistry*, 2d ed. p. 72.

Amongst the various chemical purposes to which the phenomenon of circular polarisation may be applied, we may especially mention its use in determining the quantity of any kind of sugar in solution. While some sugars give a right-handed rotation, others give a left-handed rotation, and each sugar exerts a definite amount of rotatory power. The following are the rotatory powers of the chief varieties of sugar, equal weights of each being dissolved in an equal bulk of water, and the temperature being 56°:

Cane-sugar	($C_{12}H_{22}O_{11}$),	right	73°·8
Trehalose	($C_{12}H_{22}O_{11}$),	"	199°
Melezitose	($C_{12}H_{22}O_{11}$),	"	102°.
Mycose	($C_{12}H_{22}O_{11}$),	"	193°
Dextrose	($C_{12}H_6O_{12}$),	"	56°
Lævulose	($C_{12}H_6O_{12}$),	left	106° at 14° 53° at 90°
Milk-sugar	($C_{12}H_{22}O_{11}$),	right	59°·3

For details regarding the apparatus to be employed, and the method of using it, we may refer to Miller's *Chemical Physics*, 3d ed. p. 204; and to a Memoir by Clerget in the *Ann. de Chimie*, iii., xxvi. 175. This method has been applied to determine the amount of sugar in diabetic urine, to ascertain the quantity of sugar which remains in the unfermented state in wines, and to other similar purposes. As, however, the process is one of extreme delicacy, the method must be used with great caution.

Manufacture.—The manufacture of sugar from the sugar-cane and other sources is now one of the largest branches of human industry, but this great development is of comparatively recent date; and although there are evidences of its very high antiquity in India and China, sugar appears only to have been vaguely known to the Greeks and Romans. It is mentioned by Theophrastus as 'honey in reeds;' and Lucan has the following line, which indicates a knowledge of its existence, but merely as a curious fact:

'Quique bibunt tenera dulces ab arundine succos.'

Its introduction to Europe appears to have been one of the results of the Crusades. The sugar-cane was grown in Cyprus about the middle of the 12th c.; it was from thence, at a later time, transplanted to Madeira, and at the commencement of the 16th c., was carried from the latter island to the West Indies. Originally, in all probability, only the sweet recent juice was known; for apparently the art of boiling it down, and forming it into raw sugar, was an invention of the 15th c.; and it was not until the middle of the following century that a Venetian discovered the art of refining sugar, which soon became established in Germany. The first refinery of which any notice exists was one in Dresden, as early as 1597; but long previous to this the subject had attracted so much attention as to be discussed in learned treatises one of which in particular, the *Saccharologia* of Sala, in the beginning of the 16th c., shews that the clarification of the syrup by defecation was then a matter of some importance. Still the manufacture of sugar in the countries to which it had been introduced made but slow progress, for its use was limited, by its dearness, to the wealthy. The material has now, however, become one of the commonest necessaries of life, 2,000,000 tons per annum being consumed. Until 1747, sugar was supposed to be the product of the sugar-cane only, but in that year, Marggraf, a German chemist, demonstrated that it was a natural product of other vegetables, and especially of the beet-root; and half a century later, its manufacture from that source was first commenced in Silesia. A large portion of the sugar consumed on the continent is now obtained from this source. See BEET-ROOT SUGAR.

Since we have become better acquainted with the sources of our own supplies, we have learned that a large portion of the raw sugar of the East Indies received in British ports as cane-sugar is in reality made from the juice of several palms, especially that of *Arenga saccharifera*, and the wild date, *Phœnix sylvestris*. The juice is obtained from these plants by cutting off the male spadix when young, and from the cut portion there is for four or five months a continual flow. The liquid is at first clear, and is immediately boiled down to a thick syrup, which granulates on cooling, and constitutes, if not otherwise purified, the coarse brown sugar called jaggery, which is extensively consumed in India. More carefully prepared, it is sent to Europe with sugar made in the cane-plantations, and is only distinguished from it by those well skilled in their respective qualities. If the juice is not immediately boiled, it becomes turbid, and passing into the vinous fermentation, forms the intoxicating drink called toddy.

In the British colonies of North America, and in the United States, very much sugar is made by boiling the juice or sap of the Sugar Maple-tree (*Acer saccharinum*). The *Sorghum saccharatum*, or Sugar-grass (see DURRA), is rapidly becoming of importance as a source of sugar both in North America and in the south of Europe.

Beet-root sugar is manufactured from the fresh-dug roots, chiefly of the varieties we call Mangold-wurzel. The process (which, however, is constantly undergoing modifications) is briefly described in the article BEET-ROOT SUGAR. Beet-root yields from 7 to 8 per cent. of sugar, of which only 3 to 4 per cent. are of the best quality, called *Melis*, 2 to 3 per cent. of the second quality, called *Farin*, and the remainder molasses.

The manufacture of starch-sugar is described in the article GLUCOSE.

From the beginning of the 16th c., when the sugar-cane of India was introduced to the West Indies, sugar has been one of the most important products of those islands. Careful cultivation has produced many varieties of this useful plant, some of which are better adapted than others for particular localities. The original variety introduced into the West Indies is still cultivated under the name of the *Creole Cane;* but the favourite variety is the *Otaheite Cane*, which is the most luxuriant grower, and gives the largest yield of

juice. It is the variety chiefly cultivated in Brazil, Demerara, and Venezuela, as well as the West Indies. In many parts of the East, another admirable variety is the *Batavian* or *Striped Cane;* it was originally raised in Java, and is the favourite with rum-distillers.

The extraction of juice from the sugar-cane is effected by simple pressure. In its native country, India, there are still in use in some districts

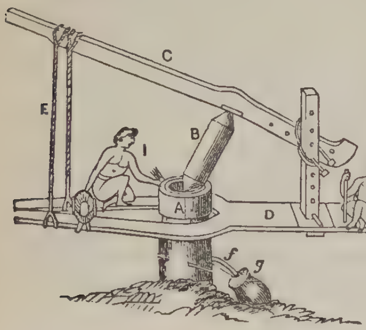


Fig. 1.

machines of the rudest construction, which are probably the same which were used a thousand years since. The Chinapatam Sugar-mill (fig. 1) consists of a mortar made by cutting down some hard-wood tree to within 2 or 3 feet of the ground, and hollowing the top of the portion left standing in the ground into the form of a mortar, A. A small hole is then bored obliquely through from the bottom of the cavity to the outside, and a pipe, *f*, conveys the juice into a jar, *g*. B is a cylindrical piece of wood, sharpened at each end, to act as a pestle, which is kept in its place with sufficient pressure by the lever C and the ropes at E. Two men are required: one at I has a basket supplied with small lengths of freshly-cut cane, which he places, two or three at a time, in the mortar, and, when necessary, removes the crushed ones; the other man sits on the other end of the train, balancing it, and at the same time drives oxen which are attached to the end of the beam D, and keep the movable parts of the mill constantly turning round. Notwithstanding the rudeness of this

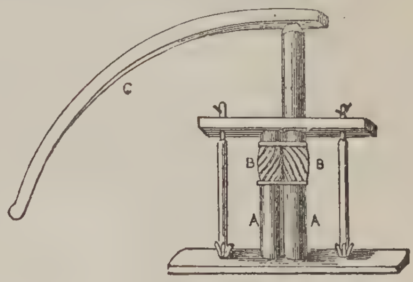


Fig. 2.

contrivance, very large quantities of sugar are made by it in India. A much better one, however, is the Chica Ballapura engine (fig. 2), which consists of

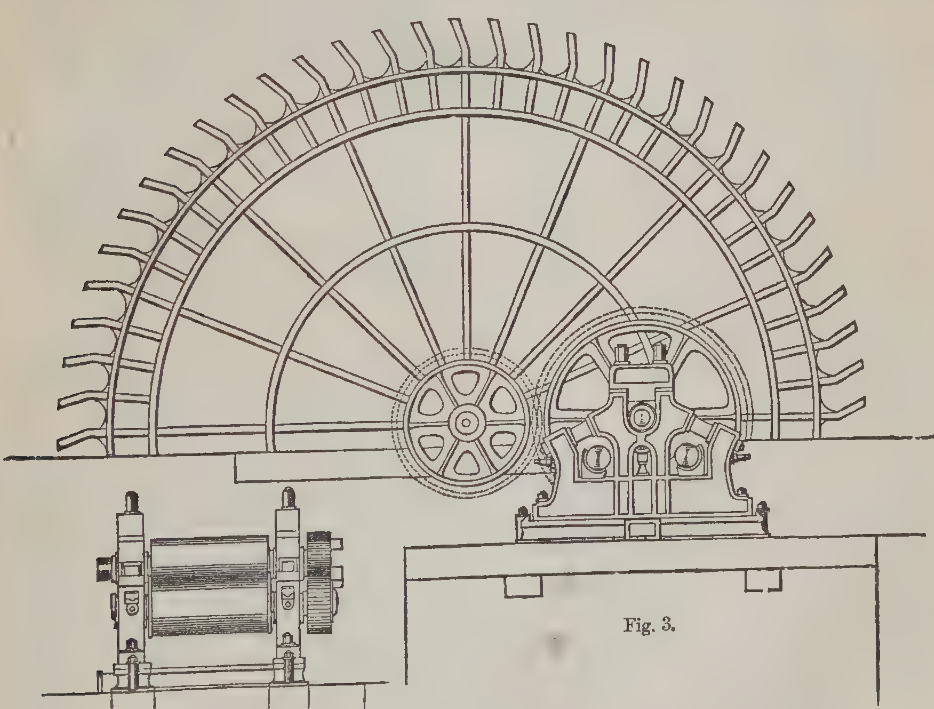


Fig. 3.

Fig. 4.

(Manufactured by W. and A. M'Onie, Glasgow.)

two upright rollers, A, A, the heads of which are formed into double spiral screws, B, B, which work in one another, so that when an ox is yoked to the long curved lever C, and goes round, one of the upright rollers, being connected with the lever, is made to revolve, and its screw carries the other

one round, but in an opposite direction. The pieces of cane are fed in by hand between the rollers, and as the juice is squeezed out, it flows down into a small hollow below the frame made to receive it, whence a small trough carries it to an earthen pot. The frame of this mill is securely fixed with stakes driven deep into the ground. In all probability, this very ancient machine has been the origin of all the most modern ones, for they all consist of rollers placed either vertically or horizontally, between which the canes are made to pass.

The mills now in general use for squeezing the juice out of the sugar-canes are very powerful machines. Fig. 3 represents an end view of a cane-mill, with the iron water-wheel and gearing for driving it, and fig. 4 represents a front view of the same mill. Some idea of the strength of those mills will be formed from the fact, that one of the rollers weighs upwards of 5 tons. The axles are 12 inches in diameter, and notwithstanding that they are made of the best wrought iron, they are not secure against breakage. The manufacture of sugar has probably been carried to greater perfection in the islands of Java, Mauritius, and Cuba than in any other parts of the world. In Java especially, in consequence of the great extent of the plantations, the planters have been able to erect very complete establishments for the manufacture of sugar.

The following very condensed account of the process of making sugar in Java will give some idea of the operation.

The canes, freed from all loose leaves, are passed through between the rollers under the greatest possible pressure that can be brought to bear upon them. The rollers revolve only from two to four times per minute. From 100 lbs. of canes, 65 to 75 lbs. of cane-juice will be expressed. This juice, which is of a sweetish taste, and of the colour of dirty water, passes direct from the mill to a small reservoir, where it usually receives a small dose of quicklime, and without delay runs off to large iron or copper vessels, heated either by a fire underneath or by steam-pipes in the liquid. As the temperature of the juice rises, a thick scum comes to the top, which is either removed by skimming, or the warm juice is drawn off from below the scum. The concentration of the juice is partly effected in a series of large open hemispherical iron pans about six to eight feet diameter, of which five or six are placed in a row, with a large fire under the one at the end. This one fire, which runs along under the whole row of pans, is found sufficient to make two or three of them nearest the fire boil violently, and in addition, it warms the juice in the pans furthest from the fire. As the juice first enters the pans furthest from the fire, it gets gradually heated, and the vegetable impurities rise in scum to the top, and are carefully removed. As the juice is ladled from one pan to the next, it boils with greater and greater vigour as it approaches nearer the fire, until in the pan immediately over the fire it seethes and foams with excessive violence; and this seems to be essential to the successful making of sugar. It is known that the presence of all those impurities which constitute the scum interferes with the crystallising of the sugar; and the rapid ascent of bubbles of steam through the liquid in the pans carries all impurities dispersed through the body of the liquid to the top, where they can be removed with facility. It is well known that great heat is very destructive to cane-juice; that is to say, it turns much of the crystallisable sugar into treacle or uncrystallisable sugar, but the gain arising from getting rid of much of the impurity in the cane-juice more than compensates for the destruction of part of the sugar. After the concentration has been carried to a given point, and all the scum has been got rid of, the application of a high heat, which would act with an increasingly destructive effect as the condensation becomes greater, is suspended, and the liquor, now of the colour of turbid port wine, and of the consistency of oil, is drawn into the vacuum-pan, where the concentration is completed at the lowest possible temperature, generally about 150° F. The vacuum-pan, shewn in fig. 5, is in universal use in all European sugar-refineries, and in all well-provided sugar-plantations. It is generally made of copper, of a spherical form, and from six to nine feet diameter. The bottom is double, leaving a space of an inch or two for the admission of steam between the two bottoms, and there is generally a long coiled copper pipe of three or four inches diameter above the inner bottom, so as to still further increase the amount of heating surface. This apparatus is made perfectly air and steam tight. Leading from its upper dome, A, there is a large pipe, B, communicating with a condenser, C, into which a rush of cold water is continually passing, so as to condense all the steam or vapour that arises from the liquid boiling in the vacuum-pan. The water which is constantly rushing into the condenser is as steadily withdrawn again by the pump at E. There is thus a constant vacuum in the pan, and, consequently, the liquid in it will boil at a much lower temperature than it would in an open pan or boiler. There is an extraordinary advantage in being able to effect

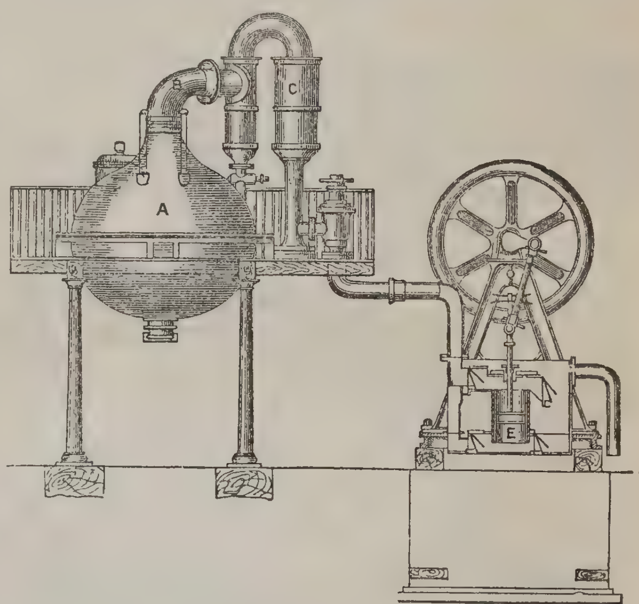


Fig. 5.—(Manufactured by W. and A. M'Onie.)

the later stages of the concentration at a low temperature, for it is when the liquid becomes thick that the destructive results of a high temperature become most excessive.

As the concentration of the liquid in the vacuum-pan proceeds, crystals of sugar begin to form, and the skill of the sugar-boiler is shewn by the uniformity of the crystals he produces. The boiling is commenced by filling in only about a third or fourth of the quantity the vacuum-pan will hold, and gradually adding more liquid as the crystals increase in size. The sugar-boiler is able to watch the changes going on in the vacuum-pan by means of small samples he withdraws from it by means of a suitable apparatus. The sugar-boiler holds those drops of thick fluid on his finger and thumb, between his eye and a strong light, and is thus able to detect those minute changes in its condition which shew that it is time to add an additional quantity. By the time the vacuum-pan is full, the contents have thickened, by the formation of crystals of sugar, into a mass of the consistency of thick gruel; it is then allowed to descend into a vessel called the heater, where it is simply kept warm until it can be run out into the 'forms,' which, in the sugar-growing colonies, are generally conical earthen pots, holding from one to two cwts. of sugar. It is allowed to cool and complete its crystallisation before the plugs, which close the bottom of the pots, are withdrawn. When this is done, from one-fourth to one-third of the contents of the form, which has remained in a fluid state, runs off into gutters leading to large tanks, from which it is again pumped up into the vacuum-pan, and reboiled, yielding a second quality of sugar. This reboiling of the drainings is repeated, with a continually decreasing result, both as to quantity and quality of the solid sugar obtained, and it is rarely carried beyond the fourth boiling. If the planter wishes to obtain Muscovada or unclayed sugar, the process is now complete, and the sugar is turned out of the forms, and packed for shipment. In some cases, the sugar is run direct from the vacuum-pans into casks or hogsheads, which replace the forms, holes being bored in the bottoms of the casks, to admit of the uncrystallised portion of the sugar draining out.

If *clayed* sugar is to be made, the forms are allowed to stand for a few days until all the treacle has drained out; and a quantity of thin mud, about the consistency of good thick cream, is then poured over the sugar, to the depth of one or two inches. The water contained in this thin mud slowly steals down through the sugar, and mixing with the coatings of treacle still adhering to the outsides of the crystals of sugar, renders them less viscid, and facilitates their descent to the bottom of the form. The mud remains, at the end of a few days, in the form of a dry hard cake on the top of the sugar, and none mixes with the sugar.

The process of claying sugar is simply washing off a coating of black or yellow treacle from a crystal of sugar, which is always white. This operation is possible without dissolving the crystal of sugar, simply because the treacle has a greater affinity for water than the crystallised sugar has. Anything that would yield a very slow and steady supply of water to the sugar, would do as well as mud or clay. There is always some loss of crystallised sugar in the process of claying, and attempts have been made to use strong alcohol for washing off the coatings of treacle from the crystals; but although alcohol dissolves treacle very freely, and scarcely acts on the crystals at all, still it has not been found to answer commercially. Besides the cost of the process, there is a difficulty in getting rid of the smell of alcohol in the sugar.

The centrifugal machine of Messrs Manlove, Alliott, & Co., has been very extensively used for getting rid of the treacle. Its action depends on precisely the same principle as that called into play when a sailor twirls a mop to expel the water from it. The centrifugal machine is simply a drum of 3 or 4 feet diameter, and 12 to 18 inches high, revolving at a great velocity on a vertical axis. The sugar, either direct from the vacuum-pan, or after it has been allowed to cool, is put, still mixed with the treacle, into the machine. As soon as the drum acquires a high velocity, its contents are forced by the centrifugal action against the drum, the cylindrical portion of which is made like a sieve, and admits of the escape of the treacle, but retains the crystals of sugar. Some idea of the efficiency of those machines may be formed when it is stated, that in a machine of three feet diameter, revolving at the usual speed of 1000 revolutions per minute, the tendency of the treacle to escape will be 514 times its own weight; that is to say, the treacle will have 514 times more force to fly off, than it has to drop off the crystal by the mere force of gravity.

Sugar-refining was unknown to the ancients, and even the refining previously referred to as having been established in Germany in the 16th c., consisted merely in clarifying the syrup, and producing a sort of sugar-candy; but one improvement followed another, until the process may now be considered as almost perfect. The chief difficulties attending the operation arise from the circumstance that the material to be operated upon is ever varying in quality. Not only is there a difference between the produce of two different plantations, but even the manufacture of the same plantation shews differences of quality; these differences arising chiefly from the presence of foreign substances, which seriously interfere with the operations of the refiner. The attempt made to test the exact quality of solutions of raw sugar by means of polarised light (see above) have hitherto been attended with little success in practice. Sugar-refining, as practised in Britain, has three distinct objects—(1) the production of loaves of thoroughly refined sugar; (2) crushed sugar; and (3) white sugar in separate crystals. The last is of comparatively recent introduction. In some existing sugar-refineries, old fashions still prevail; but our description must be confined to the most recent methods.

Sugar-refining is carried on in the United States on a great scale; Philadelphia, New York, and St Louis being the principal seats of the trade. The consumption of refined sugar has greatly increased, though some raw sugar is still used. Much of the dark-coloured sugar sold in the shops has passed through the hands of the refiners, and is simply inferior sugar, made out of the syrup which drains from the white loaf-sugar.

Sugar-refineries are built eight or nine stories high, and the raw sugar is first hoisted to the upper story, where it is dissolved in large tanks of hot water, care being taken to use as little water as possible for the purpose. A quantity of bullock's blood is stirred into the solution of sugar, and the heat being gradually raised, the albumen of the blood coagulates, and rises to the surface in the form of a thick light scum, bringing with it nearly all the mechanical impurities floating in the fluid. The liquor, still hot, is then passed into the bag-filters shewn in fig. 6. Those filters are made of a very closely woven cotton cloth, capable of retaining the minutest mechanical impurity. In order to facilitate the passage of the liquor through the bags, they are suspended in a kind of iron closet, and surrounded by an atmosphere of steam to keep the liquor hot. From the bag-filters, the liquor, now freed from all mechanical impurities, but of a

dark colour, flows into a lofty cylindrical iron filter, of about 5 or 6 feet diameter, and 20 or 30 feet high, filled with animal charcoal, that is, charcoal made of bones. This charcoal is reduced to coarse powder; and the dark offensive liquor is allowed to percolate very slowly through the mass. The result is, that it flows out at the bottom a perfectly transparent and pure solution of sugar. The charcoal can only be used for a few days at a time, because it gradually loses its purifying power; when the liquor begins to flow through it without being purified, it is taken out of the filter, and reburned, which completely revives its powers.

Fig. 6.

The liquor as it flows from the charcoal filter is a mixture of pure sugar and pure water, and perfectly transparent. The application of heat is the only mode of expelling the water, and this unfortunately blackens the sugar again. In order to get rid of the water with as little heat as possible, the colourless liquor is boiled in the vacuum-pan as in the early process of the manufacture (see fig. 5). The liquor boils in vacuo at about 150° F., and even this moderate heat has the effect of turning it quite brown. When it has been sufficiently concentrated by boiling in the vacuum-pan, which takes from 1¼ to 2½ hours, it is run into the sugar-loaf forms (fig. 7); which, after cooling, are carried to a room kept warm by means of steam-pipes. This warmth facilitates the flow of the treacle or syrup out at the aperture seen at the bottom of the form. To get rid of the coating of coloured treacle which still hangs about the crystals of sugar, a small quantity of a saturated solution of pure white sugar is poured on the top of the form. This strong liquor is unable to dissolve any more sugar, but being more fluid than the sticky coatings of treacle or syrup adhering to the crystals, it mixes with the coatings, and makes them fluid enough to flow down to the bottom of the form, leaving the crystals clear of syrup or treacle, and consequently free of all colour. This process of washing off the colouring matter from the crystals of sugar is the same in principle as the 'claying' used in the production of sugar. The loaves of sugar, after standing some time, to admit of all the liquor draining off, are wrapped in paper, and dried in stoves heated by steam. The liquor draining from the forms is reboiled in the vacuum-pan, and forms loaves of an inferior quality; and the liquor draining from the inferior loaves is again boiled into the yellow sugars known amongst sugar-refiners as bastards.

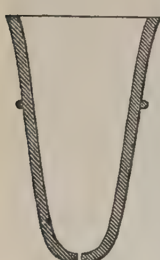


Fig. 7.

Crushed or Crashed Sugar is simply inferior loaves crushed while still soft and moist, and packed in hogsheads, instead of being left in the loaf form.

The syrup which drains from refined sugar is reboiled, and constitutes the *Golden Syrup* of the shops.

Crystal Sugar.—In making the sugar crystals, all the processes are carried on as in refining, until the syrup is clarified. Then it is boiled or concentrated in a vacuum-pan of larger size than ordinary, and the concentration is carried on until minute crystals appear. Fresh syrup is then added from time to time, great care and experience being required to insure a regular feeding of the first-formed crystals, and prevent the formation of a second crop. When the crystals are large enough, the contents of the pan are transferred to the centrifugal machines, which quickly separate the crystals in a perfectly dry state from the uncrystallisable syrup. The crystals are of a square tabular form, with a deep groove across in one direction, dividing the crystal into equal parts as in fig. 8. This kind of sugar is much liked for coffee, &c., but the crystals dissolve with difficulty.

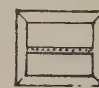


Fig. 8.

Louisiana is the chief seat of sugar production from the sugar-cane in the United States. The total number of sugar-growers in 1868 was 747, with 573 sugar-houses in operation. The total production of sugar in Louisiana has been stated to have been, in 1864, 6668 hhds.; in 1865, 15,500; in 1866, 41,000; in 1867, 37,647; in 1868, 84,256; and in 1869, 87,090 hhds. The quantity imported into the United States in 1870 amounted to 591,576 tons of sugar, 16,000 tons of melada, and 47,768,267 gallons of molasses: total value, $41,650,000. Into Great Britain, in 1869, 551,687 tons of raw sugar and 47,586 tons of molasses were imported; total value, £14,143,527.

SUGAR-CANE (*Saccharum*), a genus of grasses, natives of tropical and sub-tropical countries. The Common S. (*S. officinarum*) is originally a native of

Sugar-cane (*Saccharum officinarum*).

the East Indies, was brought to the south of Europe by the crusaders, and in the 15th and 16th centuries found its way into all the European colonies within the tropics. In Europe the cultivation of the S. has always been very limited, and is scarcely practised except in Sicily and Andalucia. In China, it extends to 30° N. lat., and in North America to 32°; in the southern hemisphere only to 22° S. lat. The plant

is a perennial, with a creeping root, sending up a number of culms or stems generally 8—12 feet high, which have many joints, are of various colours, and about 1—2 inches thick. They are filled for about two-thirds of their length with a loose, sweet, juicy pith. The leaves are ribbon-shaped, and 4—5 feet long, with a strong whitish middle nerve. The flowers are in great diffuse pyramidal panicles of a yard in length.—The Violet-coloured S. (*S. violaceum*) is particularly esteemed, and much cultivated in the West Indies.—The Chinese S. (*S. Sinense*), cultivated in China, has the stem in great part covered with the sheaths of the leaves. Cultivation has produced many varieties of these species; if, indeed, they are originally distinct species, and not themselves mere varieties.—The species of *Saccharum* are numerous; they contain much silica in the rind, and some of them are much employed in India for thatching and for making mats, as well as for screens and light fences. The Bengalese make their pens of the hollow stems of *S. semidecumbens* and *S. fuscum*.

The S. is usually propagated by cuttings. For this purpose the top joints are used. The cuttings are planted in rows three or four feet apart, and at intervals of about two feet in the rows. The largest varieties, in rich moist soils, attain a height of 20 feet; but in dry poor soils, the height is sometimes scarcely more than 6 feet. The plant *tillers* like wheat, but not to the same degree. The cane-ground is kept clean by hand-hoeing, or by the plough. Hand-hoeing was formerly universal in the West Indies, but the plough is now very generally used where the nature of the ground permits. The best varieties are ready for cutting in about ten months from the time of planting, but other varieties require a longer period of growth, from 12 to 20 months. When the canes are fully ripe, they are cut a little above the ground, and tied in bundles to be conveyed to the mill. Fresh canes, called *rattoons*, spring from the root, so that the plantation does not require to be renewed for several years; but the canes of the first crop are the largest, and a gradual decrease of size takes place. The ordinary practice on sugar estates is to renew a part of the plantation every year.

The name CHINESE SUGAR-CANE is sometimes given to the SHALOO or SUGAR-GRASS, already noticed in the article DURRA. Its cultivation in America has extended as far north as Maine. The sugar obtained from it is equal in quality to that from the true S., and the quantity is very remunerative. In Illinois, a grower procured 384 gallons of syrup per acre, which he sold to the sugar-refiners at one dollar a gallon. The whole quantity of syrup now produced from this grass in the United States is estimated as exceeding 15,000,000 gallons. Its cultivation is rapidly extending, particularly in the north-western states. The state in which at present it is most extensively cultivated is Ohio. The manufacture of sugar from it is partly carried on in large works, but chiefly on small scale, by the farmers themselves. The processes are very similar to those adopted for the sugar-cane. The plant was unknown in America till 1857. Numerous varieties are already in cultivation; one class of them, called *Sorgo*, being derived from Chinese seed; another, called *Imphee*, from seed which was brought from Africa. Deep ploughing is of great importance in preparing the land for the sugar-grass. Rich land is best suited for it, and well-rotted manure is of great use. The seed is sown in spring, as soon as the winter frost has passed away, in rows 4 feet apart, and the plants are thinned out to 12 or 18 inches. The crop is cut rather before the seed is mature. If not touched by frost before being cut, it may be kept a long time without injury. A frost which merely kills the blades, and does not freeze the stalk, does no considerable harm.

SUGAR-OF-LEAD, the common name for Acetate of Lead. See LEAD.

SUHL, a town of Prussia, province of Saxony, and government of Erfurt, is situated on a small stream, called the Lauter, in a romantic valley on the south-west side of the Thuringian Forest, 32 miles south-south-west of Erfurt. The name S., which in the Sorb-Wendish dialect means salt, is probably derived from the salt springs, formerly much worked. Mining is extensively carried on in the neighbourhood, and has been so for centuries. The principal manufactures are iron and steel wares, chemical preparations, paper, and leather. S., celebrated in the days of chivalry as the 'Arsenal of Germany,' still maintains its ancient reputation as a manufactory of arms. Pop. 8987.—Its history is very interesting; see Werther's *Sieben Bücher der Chronik der Stadt Suhl* (2 vols. Suhl, 1846—1847).

SUHM, PETER FRIDERIK, a Danish historian, was born in Copenhagen, 18th October 1728, of an ancient and noble family, and was sent to the university of Copenhagen, where he graduated in law in 1748. A few years later, he went to Norway, for the sake of prosecuting his studies in philology and history, in conjunction with the learned historian Schöning, and did not return till 1765 to Copenhagen, where he continued to reside till his death in 1798. Among his numerous works on the early mythical and political history of Denmark we may instance the following: *Forsoeg til Forbedringer i den gamle danske og norske Historie* (1757); *Om de nordiske Folks ældste Oprindelse* (1770); *Om Odin og den hedenske Gudelære* (1771); *Critisk Historie af Danmark i den hedenske Tid*, i.—iv. Band (1774—1781); *Historie af Danmark*, 1*ste Tome* (1782). Besides numerous other historical essays, moral treatises, poetic compositions, contributions to the philosophical and literary periodicals of Germany, France, and Denmark, &c., he edited *Scriptores Rerum Danicarum Medii Ævi*, from vol. iv. to vol. vii. inclusive (Hafniæ, 1776—1792), and took upon himself the cost and supervision of the publication of many remains of old northern literature. S. was an indefatigable collector of rare and curious books; and in 1796, in return for a pension from the government, he made over to the Royal Library of Copenhagen his valuable library of 100,000 volumes, to which he had previously allowed the public access. After the death of his only son, he devoted the greater part of his ample means to the purpose of having copies made of the more valuable MSS. in the collection, many of which were, moreover, printed at his sole charge; besides which, he founded scholarships, and afforded direct pecuniary assistance to many poor students and learned men. He died in 1798. S.'s collective writings were brought out by S. Poulsen, in 16 vols., between 1788—1799; and various editions of his lesser works have at different times appeared in Germany, as well as in Denmark, where he is justly regarded as one of the most learned and laborious and patriotic writers of his country.

SU'ICIDE (Lat. self-murder) is a heinous crime, by the law of the United Kingdom, though it was treated as venial by the Roman law, and was the subject of panegyric by Stoic philosophers. The law of England treats it as a felony, and hence there may be accessories to it, so that if A persuade B to kill himself, and B does so, A is guilty of murder. The term **suicide**, or *felo de se*, not only

includes one who deliberately kills himself, but also one who in maliciously attempting to kill another is himself killed. If A, however, requests B to kill him, and B does so, A is not a *felo de se*, though B is a murderer. If A and B mutually agree to commit suicide together, and in the attempt one only dies, the other is guilty of murder. When it is said that a man was a suicide, this implies that he was in his senses, for otherwise he committed no crime; hence an insane person, unless when in a lucid interval, cannot commit the crime. The punishment inflicted on a suicide consisted, formerly, in an ignominious burial in the highway, with a stake driven through the body, and without Christian rites; also the legal consequence was forfeiture of the goods and chattels to the crown. The only consequences now are forfeiture of goods, and deprivation of Christian rites. The burial now takes place in a churchyard, but between 9 and 12 P.M. An attempt to commit suicide is not punishable like an attempt to murder a third party, nevertheless it is a misdemeanour. The consequences of suicide on the contract of life-assurance are generally guarded against by an express stipulation, that if the assured die by his own hand, the policy shall be void; and it has been held by the courts that the policy is forfeited even though the party destroyed himself in a fit of frenzy or delirium.—In Scotland, suicide is also followed by forfeiture of the movable estate to the crown.

There are, no doubt, even in modern times, some who hold the theoretical opinion that suicide is permissible in certain circumstances; but in regard to those who have actually committed or attempted the crime, there has almost always been detectable evidence of cerebral changes; or, at all events, of that irritation and excitement which initiate and accompany molecular disorganisation of the nervous structure. In short, suicide, as a rule, is a symptom of some form of insanity, permanent or temporary, in which the emotions and passions are excited or perverted. Suicide is likewise a concomitant of certain bodily diseases; for example, of dilatation and fatty degeneration of the heart, of blood-degeneration, of affections of the intestinal mucous membrane, of the uterus, and of the brain and nervous matter; and it may be regarded as a frequent sequence of the melancholic, the morose, and hypochondriacal temperament. It has appeared as an epidemic; it has been observed as a hereditary tendency in certain families; and as a tendency more frequently exhibited by males than females; more frequently by the educated and affluent than by the industrial and ignorant classes; most frequently in large cities; and as directly engendered by luxury, political agitation, gambling, intemperance, and demoralisation. It would appear, however, that indulgence and asceticism, riches and extreme poverty, claim nearly an equal number of victims. It has been calculated that twice as many artisans commit suicide as labourers. In 1840, it was found that in every 10,000 of the population, 1·33 masons, carpenters, butchers, 7·43 tailors, shoemakers, bakers; 4·9 bankers, professionals; 2·0 of persons assured in Equitable Office; 7·8 dragoons; 6·7 servants and coachmen; 4·0 paupers, died by their own hand. Observation has shewn that from 20 to 35 is the most influential age in inducing the suicidal tendency; and the age appears to determine, to a certain degree, the modes of death selected as well as the proclivity. As might be expected, the nature of the delusion, the accessibility of the means, imitation, the profession or pursuit of the individual, novelty, and notoriety, all influence the choice of the instrument or means of death. The theomaniac dies by crucifixion; the great majority by ropes, rivers, wells, razors, arsenic; the medical man by aconite, chloroform. Even sex is characterised by peculiar preferences. Females seek voluntary death according to the following order of the means—hanging or strangulation, abstinence, precipitation, drowning, cutting, poison; males, again, according to this order—cutting, shooting, hanging, poison, drowning. Race, climate, country, and the distinguishing polity of different societies to a certain extent affect the proportion of suicides to the population. In the kingdom of Sweden, there is calculated to be one suicide to every 92,375 inhabitants; in Saxony, 1 to 8446; in Russia, 1 to 34,246; in the United States, 1 to 15,000. In Paris, 1 suicide occurs in 2700; in St Petersburg and London, 1 in 21,000 citizens. Middlesex, again, is the most prolific of all English counties; Chester least so: there being in the former, 10·5, in the latter, 7·2 to 100,000 people. In all England, the proportion is 7·4.—*Anatomy of Suicide*, Forbes Winslow; *Du Suicide et de la Folie Suicide, &c.*, à Brièrre de Boismont; *Traité du Suicide*, Louis Bertrand; *English Suicide Fields*, Radcliffe, p. 701; *Medical Critic*, 1862.

SU′IDÆ, a family of Mammalia, of the order *Artiodactyla*, division *Omnivora*, having the feet generally four-toed, the hinder feet sometimes three-toed; the toes hoofed, the two front toes forming the principal part of the foot, the others smaller and scarcely touching the ground; the snout abruptly truncated, mobile, muscular, and sensitive, but not elongated into a proboscis; the incisor teeth variable in number, the lower ones all directed forwards, the canines projecting, and bent upwards; the stomach little divided. To this family belong hogs, wart-hogs, peccaries, &c., and many extinct types.

SUIDAS, the name given to the compiler of a *Lexicon* some time during the Byzantine Empire. When he lived, or who he was, or whether he was even called S., no one can say; but it is customary to place him about the 10th or 11th century. The *Lexicon* bears unmistakable evidence of having gone through many hands; and though we can fix the date when several of the articles *must* have been written, it is impossible to ascertain whether they are the composition of the first compiler or of a later editor. The work is a sort of cyclopædia, giving an explanation of words, and notices of persons, places, &c., in alphabetical order. It is utterly destitute of literary or critical merit, but is valuable in the eyes of scholars on account of its numerous extracts from ancient Greek writers, grammarians, scholiasts, and lexicographers, whose writings in many cases have perished. The first edition appeared at Milan (1499); since then, the best editions have been those of Küster (Camb. 3 vols. 1705), Gaisford (Oxf. 3 vols. 1834), and Bernhardy (Halle, 2 vols. 1834).

SU′I JU′RIS, in the Roman law, the condition of a person not subject to the *Patria Potestas* (q. v.). The paterfamilias was the only member of a family who was *sui juris*, all the rest being *alieni juris*, including sons, unmarried daughters, the wife, and the wives and children of the sons of the paterfamilias. A daughter, on her marriage, passed into the family of her husband; but a son did not become *sui juris* by marriage. A son or unmarried daughter became *sui juris* on the death of the paterfamilias. In his father's lifetime, a son could only become *sui juris* by emancipation. The laws of the Twelve Tables declared that a son three times sold by his father should be freed from his power; and the ceremony of emancipation was of the nature of a fictitious sale gone through three times, in order to liberate

the son from parental control. *Connubium* being the foundation of the *patria potestas*, a bastard was *sui juris*.

SUIR, a river of Ireland, rising in the north of the county of Tipperary, flows south through that county by the towns of Thurles and Cahir. Ten miles south of Cahir it bends eastward, forming the boundary of Tipperary and Waterford, and passing by Clonmel and Carrick. It then passes out of Tipperary, and meeting the Barrow at Passage, Waterford, falls into the sea in Waterford Haven, after a course of about 100 miles. It is navigable by barges as far as Clonmel.

SUIT IN CHANCERY (British) is the process corresponding to an action in a court of law. The suit generally commences with a bill, i. e., a petition to the Lord Chancellor, which sets forth the grievance, with a prayer for redress. It is signed by counsel, and is served on the defendants, either personally or at the dwelling-place. They must then enter appearance, and put in either an answer or a demurrer, or a plea, which are the several defences to the suit according to the nature of the subject-matter. After the hearing, which takes place before a Vice-chancellor or the Master of the Rolls, a decree is pronounced, which may be appealed to the Lord Chancellor or Lords-justices, and finally to the House of Lords.

SUL, Rio Grande do. See Rio Grande do Sul.

SULIMA'N MOUNTAINS, a mountain range upwards of 350 miles in length, running from north to south, and forming the boundary between Afghanistan and the Punjab. In lat. about 33° 20′, it throws off the lateral branch of the Salt Range (q. v.). The highest summit of the range is Tacht-i-Suliman (Solomon's Throne), 11,000 feet high, and covered with snow for three months of each year.

SULI'NA, one of the lower branches of the Danube (q. v.), flows through the middle region of the delta of the great river, and enters the sea at about the same distance from the Kilia mouth on the north and St George's mouth on the south. It is the smallest outlet of the Danube, and conveys only $\frac{2}{27}$ths of the main river to the sea; but its channel through the bar that lines the coast is deeper than that of the other mouths, and therefore the S. is more frequented by vessels than any other branch of the Danube.

SU'LIOTS, a people in and around the valley of Acheron, the southern corner of the pashalik of Janina (*Epirus*) in European Turkey, are a mixed race, being partly of Hellenic and partly of Albanian origin. They are the descendants of a number of families who fled from their Turkish oppressors to the mountains of Suli (whence they derive their name) during the 17th century. In this obscure corner of the Turkish Empire they prospered, and towards the close of the 18th c., numbered 560 families, inhabiting 90 hamlets. For about 15 years they heroically resisted the encroachments of Ali Pasha (q. v.) of Janina upon their independence, the very women taking part in the strife. Vanquished in 1803, they retreated to Parga, and afterwards to the Ionian Islands, where they remained till 1820, when their old oppressor, Ali Pasha, finding himself hard pressed by the Turks, invoked their aid, offering them guarantees for his faith, and his grandson as a hostage. Eager to return to their cherished home, they accepted these terms, and under Marcos Bozzaris (q. v.), maintained a long and desperate conflict with the Turks, but were ultimately forced again to flee from their country, and take refuge to the number of 3000 in Cephalonia, though a large remnant preferred to skulk in the neighbouring mountains. Though, after this, they took an active and glorious part in the war of Greek independence, their country was not included by the treaty of 1829 within the Greek boundary-line; but many of them, as Bozzaris (son of Marcos) and Tzavellas, have since been raised to important political offices in the new kingdom of Greece.—See Perrhaebos's *History of Suli and Parga*, an interesting work, in the modern Greek language (2d ed., Venice, 1815), translated into English (Lond. 1823); and Lüdemann's *Wars and Ballads of the Suliots* (Leip. 1825)

SU'LLA, L. Cornelius, surnamed by himself Felix, the ablest Roman after the younger Scipio until the appearance of Julius Cæsar, was born 138 B. C. His family was a member, but not a distinguished one, of the Cornelian *gens*, or 'clan.' In 107 B. C., he was elected quæstor, and sent to Africa with the cavalry that the consul Marius (q. v.) required for prosecuting the Jugurthine War. He rapidly acquired a brilliant reputation as an officer, and crowned a series of important services by inducing Bocchus, the Mauritanian king, to surrender Jugurtha, whom he brought in chains to the Roman camp (106 B. C.). Marius was not over well pleased at the distinction achieved by his subordinate. In the campaigns that followed (104—101 B. C.) against the Cimbri and Teutones, S.'s reputation continued to rise, although Marius was still regarded (and with justice) as the first general of the state. For several years after the destruction of the barbarians, S. lived quietly, taking no part in public affairs; but in 93 B. C. he stood for the prætorship, and won it by a liberal distribution of money among the people. Next year, he was sent to Cilicia as proprætor, to replace Ariobarzanes on the throne of Cappadocia, from which he had been driven by Mithridates. On his return to Italy (91 B. C.), the long-smouldering animosity between Marius and him was on the point of bursting forth, but the terrible *Social War* forced all Romans to postpone their quarrels until the common danger had been averted. Both Marius and Sulla commanded armies in this great struggle; but the successes of S. threw those of Marius into the shade, and the mortification of his rival was deep and bitter. In 88 B. C., S. was elected consul along with Q. Pompeius Rufus, and the senate conferred on him the command of the Mithridatic War. But this was a command that Marius himself passionately desired, and when he heard that S. had obtained it, he rushed headlong into treason and civil war.

Here it may perhaps be necessary to observe that Marius and S. were not only personal rivals, but the leaders of opposite political parties. The former, a man of humble origin (see Marius), was a rough, stubborn, irascible, and illiterate *plebeian;* the latter, a finely cultivated *patrician*, subtle and sagacious in policy, and winning in manners. In the terrible scenes that ensued, although S. shewed himself by far the fiercer and more sanguinary of the two, it should not be forgotten that it was Marius who commenced the contest. Allying himself with the tribune P. Sulpicius Rufus, a political adventurer in difficulties, Marius placed himself at the head of the new Italian party, on which the rights of Roman citizenship had been conferred, and hoped to force the senate to recall the appointment of S. to the command of the expedition to the East. S. was compelled to flee to Nola in Campania, where his camp then was; but finding the soldiers full of enthusiasm, he resolved to lead them against the pseudo-government that had been established at Rome. The story of the overthrow of the Marian party, the expulsion of Marius, and his subsequent wanderings in Africa, &c. are well known, and intimately as these events

are inwoven with the fortunes of S., cannot be repeated here. Suffice it to say, that after settling affairs at Rome as well as he could, S. embarked for the East (87 B. C.), and was away for four years. Most of his fighting, however, was done in Greece against Archelaus, an ally of Mithridates, whom the latter repeatedly subsidised with men and money. Athens was stormed and plundered (86 B. C.), and Archelaus himself was defeated with frightful slaughter at Chæroneia in the same year, and again in the neighbourhood of Orchomenos (84 B. C.). S. now crossed the Hellespont, crushed Fimbria, a general sent out by the Marian party (which, in S.'s absence, had again got the upper hand in Italy), forced Mithridates to sue for peace, and after extorting heavy contributions from the cities of Asia Minor, sailed for Italy, and landed at Brundusium in the spring of 83 B. C. Marius was now dead, but his party were strong in numbers, if not in organisation; yet, before the close of 82 B. C., the Marian party in Italy was utterly crushed. In Spain, however, under the gallant and high-souled Sertorius (q. v.), it held out for ten years longer.

When S. felt himself master of the situation, his thoughts turned to revenge. Then followed the fearful period of the *proscriptions* (81 B. C.)—a virtual 'Reign of Terror' throughout Italy, the object of which was literally to extirpate the Marian party. In this, however, it was only partially successful; and the next generation saw that party rise to more splendid predominance than ever in the person of Julius Cæsar (q. v.), nephew of old Marius. In 81 B. C., S. got himself appointed dictator, an office which he held until 79 B. C. This period was signalised by his framing a series of laws—often spoken of collectively as the 'Sullan legislation'—the design of which was to make the senate and the aristocracy as vigorous and powerful as in the times of the Punic Wars, but which utterly failed of its end.

On resigning his dictatorship, S. retired to his fine estate at Puteoli, to enjoy at his ease those sensual pleasures to which he had been deeply addicted from his earliest manhood. Literature, wine, and women were luxuries in which he had always indulged, but now he wholly devoted himself to them—in a sort of *swinish* manner. It is strange to reflect that the man who undertook to legislate with the view of mending the public morals, should himself have surpassed in profligacy all his contemporaries. What more convincing proof could we have that morality in Rome had ceased to be more than a name! S.'s debaucheries hastened his end. He died 78 B. C., when only 60 years of age, of the disgusting disease known as *Morbus Pediculosus*.

SULLIVAN'S ISLAND, a large island, six miles below Charleston, South Carolina, U.S., between the harbour and ocean, the site of Fort Moultrie, one of its defences, and of the summer residences of the wealthy inhabitants. When Fort Moultrie was evacuated by Major Anderson, December 26, 1860, several batteries were erected on the shore of this island, bearing upon the channel and Fort Sumter.

SULLY, MAXIMILIEN DE BETHUNE, DUKE OF, the celebrated minister of Henry IV. of France, was the second son of François, Baron de Rosny, and was born at Rosny, near Mantes, in 1560. The Rosny family, an offshoot from the great House of Flanders, was never possessed of much wealth or influence, and had severely deteriorated in both respects during the early religious wars. S. was at an early age committed to the care of Henry of Navarre, the head of the Huguenot party, which not only obtained for him an excellent education, but laid the foundation of a companionship which lasted, without intermission, till Henry's death. After narrowly escaping during the St Bartholomew massacre, he accompanied his patron in his flight from court (1575), and during the civil war which followed, exerted himself to the utmost, by daring valour in the field and otherwise, to serve the master for whom he cherished the most absorbing devotion. After Henry's authority had been well established, S., who had for some years previous been his trusted adviser, became (1594) counsellor of state and of finance. The financial affairs of the country were then in a frightful condition; from the chief of the department down to the very lowest country agent, the administration was an organised system of pillage, and but a small percentage of the taxes levied found its way into the imperial treasury. The Baron de Rosny was the very man to remedy this state of matters; rude, obstinate, and haughty, but at the same time resolute, active, indefatigable, wholly devoted to his master's interests; and backed by the influence of Gabrielle d'Estrées, and by Henry's own clear-sighted convictions, he cared nothing for the clamour and hatred of the court, which had largely profited by the former state of chaos. Not content with regulating the affairs of the revenue from the seat of power, he made a tour through the chief provincial districts, armed with absolute authority, personally examined the accounts, dismissed or suspended delinquents, and largely replenished the treasury with the ill-gotten wealth which he compelled them to disgorge. By indomitable perseverance, he little by little brought the affairs of the country into an orderly state; although in the diminution of the expenditure his efforts were by no means so successful, as the king, his mistresses, and the other companions of his pleasures, combined to oppose all retrenchment as far as they were concerned. In 1596, the disposable revenue of the state was 7—9 millions; in 1609, it was no less than 20 millions, with a surplus of 20—22 millions in the treasury, and the arsenals and fleet in a state of excellent equipment. S., however, was more than a mere financier; he had the supreme charge of various other branches of the administration, zealously promoted agriculture by diminishing the taxes of the peasantry, encouraging export trade, draining marsh-lands, and constructing numerous roads, bridges, and causeways. S. was the servant of the king and government alone, and was of necessity disliked by the people for his severity, by the Catholics for his religion, and by the Protestants for his invariable refusals to sacrifice the smallest jot of his master's or the country's interest for their sake. Accordingly, with the death of Henry, his career of supremacy was at once ended, and he was forced to resign the superintendence of finance, 26th January 1611, though he retained his other high offices, and was presented by Marie de Médicis with 300,000 livres as acknowledgment of his services. He had been created Duke of Sully and Peer of France in February 1606. S. wrote three treatises on war and police, which are lost, and two pieces of verse, which are extant; but the work which will ever be connected with his name is the *Mémoires des sages et royales Œconomies d'Estat de Henry le Grand;* a dull, wearisome, and disorderly collection of writings, but of priceless value to a historian of Henry IV.'s time. S. printed the first two volumes of the *Mémoires* at his own château of Sully in 1634, the third and fourth were published at Paris in 1662, and the whole has been several times republished, as well as translated into English, German, and Russian. S. died at Villebon,

near Chartres (Eure-et-Loir), 22d December 1641. Artists have generally represented S. as older than Henry IV., while in reality he was seven years younger.

SULMO'NA, or SOLMONA, a city of Southern Italy, province of Aquila, in the Abruzzi. Pop. 13,585. It is situated in a vast fertile plain, watered by two rivers, and bounded by hills. It is very well built, having one very wide street in the centre of the city. There is a handsome town-hall, a cathedral, and a convent dedicated to S. Pietro Celestino, built with stones from the ancient *Corfinium*. It has paper manufactories, dye-houses, and tan-yards. S. was the birthplace of Ovid. In the 8th and 9th centuries, it was sacked by the Saracens, but was restored under the Normans, and has ever since been a flourishing and industrious city.

SU'LPHATES. See SULPHURIC ACID.

SU'LPHIDES, METALLIC, formerly known as *Sulphurets*, are combinations of sulphur with a metal. Many of them occur native, and form highly valuable ores. They are all solid at ordinary temperatures, and, with the exception of those of potassium, sodium, calcium, strontium, barium, and magnesium, are insoluble in water; they are, moreover, conductors of electricity. Many of them, especially of those that occur native, exhibit very brilliant and characteristic colours. The same metal may have several sulphides, and in general there is a sulphide for each oxide. The sulphides are, however, sometimes the more numerous. Most of these compounds may be fused at a heat a little above redness, and if the air be excluded, the protosulphides (those containing one atom of sulphur and one atom of metal) remain unaffected; but many of the higher sulphides, such as the disulphide of iron (Fe_2S_2) and the disulphide of tin (SnS_2), give off an atom of sulphur, and are reduced to protosulphides. If, however, there is a free admission of air or of oxygen gas to the heated sulphides, they are all decomposed, the sulphur becoming oxidised, and passing off as sulphurous acid (SO_2), while the metal usually remains in combination with oxygen. When heated before the blowpipe, most of the sulphides evolve an odour of sulphurous acid, and very small quantities of soluble sulphides may be detected in neutral or alkaline solutions by the addition of a solution of nitroferrocyanide of sodium ($Na_3Fe_2Cy_5(NO) + 2Aq$), when a magnificent purple colour, which, however, is not permanent, is evolved. It has very recently been discovered by Mr Barrett, and announced in his paper 'On some Physical Effects produced by the contact of a Hydrogen Flame with Various Bodies,' in the *Philosophical Magazine* for November 1865, that the sudden appearance of a blue colour when the hydrogen flame is brought in contact with a body containing sulphur, is a most delicate test for the presence of this element, detecting it even when the nitro-prusside of sodium test fails. By this test Mr Barrett detected $\frac{1}{1000000}$th of a grain of sulphur.

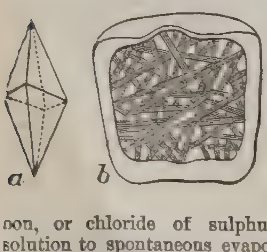
The sulphides are prepared in various ways, of which it is sufficient to notice the most important. (1.) The protosulphides of the metals of the alkalies and alkaline earths may be obtained by decomposing their sulphates by igniting them in closed vessels with charcoal, the oxygen being removed in the form of carbonic oxide. (2.) Many of the metals, when heated with sulphur, combine directly with it; sulphide of iron, for example, is usually prepared in this manner. (3.) Hydrated sulphide of tin, titanium, molybdenum, tungsten, vanadium, arsenic, antimony, bismuth, copper, lead, mercury, silver, gold, and platinum with its allied metals, may be obtained by passing a stream of sulphuretted hydrogen through neutral or acid solutions of their salts, when they are precipitated in an insoluble form; and the hydrated sulphides of zinc, iron, manganese, cobalt, and nickel may be prepared by double decomposition, by mixing a solution of the salt of the metal with a solution of a sulphide of one of the metals of the alkalies, as, for example, sulphide of potassium: thus, sulphate of zinc, if mixed with sulphide of potassium, yields sulphate of potassium, which remains in solution, and sulphide of manganese, which falls as an insoluble precipitate. 'In many cases,' says Professor Miller, 'the atoms of these hydrated sulphides are characteristic of the metal; for example, the hydrated sulphide of zinc is white; that of manganese, flesh red; those of cadmium, arsenic, and persulphide of tin are yellow; that of tersulphide of antimony is orange red; and that of the hydrated protosulphide of tin is chocolate brown. The sulphides of molybdenum, rhodium, iridium, and osmium are brown, each with its peculiar shade, whilst in a large number of instances—including the sulphides of iron, cobalt, nickel, uranium, vanadium, bismuth, copper, lead, silver, mercury, gold, platinum, and palladium—the precipitated sulphides are of a black, more or less pure.'—*Inorganic Chemistry*, 2d ed., 1860, p. 322. A recollection of the colours of these precipitates will save the young chemist a large amount of labour in testing for the presence of the metals.

SULPHOCYA'NOGEN AND THE SULPHOCY'ANATES. The former of these terms is given to a monobasic radical, CNS or CyS, which has never yet been isolated, but which forms an acid compound, known as hydrosulphocyanic acid (CNHS), with hydrogen, and yields numerous metallic salts. These salts, known as sulphocyanates, may be represented by the general formula, Cy.M.S, where M represents any metal. The sulphocyanates of potassium, sodium, and ammonium are crystallisable and soluble in water; those of the heavy metals are comparatively insoluble. These salts do not possess the poisonous character of the cyanides. *Sulphocyanate of potassium* (KCyS) is anhydrous, but very deliquescent, and occurs in long streaked colourless prisms, somewhat resembling nitre both in appearance and taste; it is extremely soluble in water, and fuses on the application of a gentle heat. The *sulphocyanate of mercury* is a white powder which possesses the property of swelling or growing in size to an almost incredible degree when moderately heated, so as to decompose it into a mixture of mellone (C_9N_{13}) with a little sulphide of mercury. The resulting mass often assumes a most fantastic shape, and is sufficiently coherent to retain its form; it is of a yellow colour externally, but black within. It is this sulphocyanate which is the ingredient of the well-known toy known as 'Pharaoh's serpents.' Each serpent consists of a little cone of tinfoil, resembling a pastille in shape, and filled with the above-named compound. On lighting the cone at the apex, there begins to issue from it a thick serpent-like coil, which continues twisting and increasing in length to an extraordinary degree, the serpent-like shape resulting from the salt being burned in the tinfoil cone. The compound is readily obtained by precipitating a strong solution of pernitrate of mercury with sulphocyanate of ammonium, which is most cheaply prepared by Mr. Wood's method from bisulphide of carbon.

SULPHOVI'NIC or ETHYL-SULPHURIC ACID ($(C_2H_5)HSO_4$) is formed by mixing alcohol with an equal bulk of oil of vitriol. Great heat

is evolved, and the two bodies enter partially into combination; this new compound acid possessing only half the saturating capacity of sulphuric acid. In connection with the theory of the formation of ether from alcohol and sulphuric acid, it may be observed that this sulphovinic acid is developed as an intermediate product, if the temperature be raised to 212°, but not otherwise. This is one of the class of acids to which the term *vinic acids* is applied.

SULPHUR (symb. S, equiv. 32, sp. gr. of rolled sulphur, 1·98; of octahedral crystals, 2·05; and of amorphous sulphur, 1·957; sp. gr. of vapour, 6·617 at 824, and 2·2 at 1900°, atmospheric air being the unit of comparison for the vapour) is one of the most important of the non-metallic elements. At an ordinary temperature, it exists as a solid, brittle, tasteless, and inodorous body, of a characteristic yellow colour, and insoluble in water. A piece of solid sulphur, heated to a temperature of 239°, fuses into a thin yellow liquid; while in closed vessels, it may, by a further heat, be distilled, the boiling-point being about 824°, and at this temperature it yields a deep yellow vapour, of sp. gr. 6·617. When the sulphur-vapour comes in contact with cold air, it condenses in the form of a fine yellow powder, known as *Flowers of Sulphur*. If fused sulphur be rapidly cooled, it solidifies into a compact mass, of a granular crystalline texture; and if, in its liquid state, it be allowed to run into cylindrical wooden moulds, we obtain it in the ordinary form of roll-sulphur, or common brimstone; if, on the other hand, it be allowed to cool slowly, it crystallises in long, glistening, deep, yellow, oblique prisms, with a rhombic base, which, however, soon lose their most characteristic properties. As native sulphur is frequently met with in yellow crystals, whose form is derived from the octahedron with a rhombic base, it is obviously a dimorphous substance. It has been already stated that sulphur fuses at 239°; from that temperature up to 280°, it forms a yellow, transparent, limpid liquid; as the heat increases, the colour becomes brown, and almost black, and the liquid becomes viscid, these changes being very distinctly seen at 350°. If the external application of heat be steadily continued, it will be found that for a while the temperature remains constant, but it afterwards rises, and at nearly 500°, the sulphur again liquefies, although less completely than when first melted. If it be now suddenly cooled by pouring it, in a slender stream, into cold water, we obtain a spongy, tenacious, and plastic mass, which may be drawn out into elastic threads, whose colour, after they have cooled, varies from an amber to a deep brown colour, according to the heat that has been employed. After some hours, the ductile sulphur loses its characteristic properties, increases in density and returns to the brittle form; or, if it be heated to 212°, it suddenly returns to the brittle condition; the temperature rising to 230° during the change. Hence, sulphur may be obtained in three (if not in more) allotropic states, which are distinguished by the symbols Sα, Sβ, Sγ. The first variety, Sα, is the native octahedral crystal of sulphur (a); it may be obtained artificially by dissolving sulphur in bisulphide of carbon, or chloride of sulphur, and submitting the solution to spontaneous evaporation. These crystals are semi-transparent, of an amber-yellow colour, and undergo no change on exposure to the air. The second variety, Sβ, is the oblique prismatic crystal already described as being formed when fused sulphur cools slowly. The best method of obtaining these crystals is to melt a few pounds of sulphur, and allow it to solidify on the surface. On perforating the external crust with a hot wire, and pouring out the sulphur that remains liquid, the interior of the cavity is found to be traversed in all directions by these crystals (b), occurring as transparent brownish needles, having a specific gravity considerably less even than that of roll-sulphur. On exposure to the air, they soon lose their coherence, and form an opaque and crumbling mass, consisting of minute rhombic octahedra. This conversion of the prismatic into the octahedral form takes place immediately, if the prisms are immersed in bisulphide of carbon. The third variety, Sγ, is the plastic amorphous sulphur, which has been sufficiently described. If sulphur be frequently heated to 600°, and suddenly cooled, a black variety of this element is produced; and a red variety has been obtained, but the redness is now supposed to be due to the presence of a trace of some fatty body.



a *b*

Sulphur is a bad conductor of heat, and the mere heat of a warm hand often causes it to crackle, and even to fall to pieces, from the unequal expansion. It is an insulator of electricity, and becomes negatively electric by friction. It is slightly soluble in alcohol, ether, and the fatty oils; its best solvents being the bisulphide of carbon and chloride of sulphur. When it is heated in the air, it takes fire at about 470°, burning with a blue flame, and becoming converted into sulphurous acid, whose pungent suffocating fumes are characteristic of sulphur. This element is second only to oxygen in its powerful affinity for other elements, with most of which it unites, and often in several proportions. With most of the metals it combines very readily, and in some cases, with a development of light and heat; thus, silver and copper burn in sulphur vapour just as iron-wire or zinc-foil burns in oxygen. In consequence of its power, with the aid of heat, of forming sulphurous acid with the oxygen of the air, and thus rendering the latter incapable of supporting combustion, burning sulphur may be usefully employed for the extinguishing of fire—as, for example, in chimneys.

Sulphur occurs very widely distributed in the mineral kingdom, partly free and partly combined with other elements. The free sulphur is either found pure in regularly formed crystals, or intimately mixed with earthy matters. The principal sources of crystalline sulphur are Urbino in Italy, Girgenti in Sicily, and Radoboy in Croatia; while the earthy sulphur is mainly derived from Italy, Moravia, and Poland. Iceland is rich in both varieties, and California supplies large quantities for her oil of vitriol works. At present, by far the largest quantity of the sulphur employed in Europe comes from Sicily; and, as a general rule, it is abundant in volcanic districts. In the form of sulphide, sulphur occurs abundantly in combination with iron, copper (iron and copper pyrites), lead (galena), zinc (blende), &c., the bisulphide of iron (or iron pyrites) furnishing much of the sulphur that is employed in the manufacture of sulphuric acid. Sulphur is still more extensively distributed in the form of sulphates, the sulphates of calcium, magnesium, barium, &c. being abundant natural productions. In the vegetable kingdom, sulphur is a constituent (although only to a small amount) of the albuminous bodies which are so widely diffused in plants; and of certain volatile irritant oils, as those of mustard, garlic, assafœtida, &c.; and, moreover, the vegetable juices contain it in the form of

certain sulphates. In the animal kingdom, it is not only a constituent of the albuminous, fibrinous, and gelatinous tissues, but of the hair, saliva, bile, urine, &c. The two animal substances in which it is most abundant are Cystine (q. v.), an occasional constituent of urinary calculi, and Taurine (q. v.), a constituent of the bile, in both of which it forms about a quarter of the entire weight.

It would be out of place in this article to enter into details regarding the *extraction* or *preparation* of sulphur. It is sufficient to state that the grosser impurities are removed by crude processes of fusion and distillation at or near the place from whence it is obtained. That which is imported into Britain undergoes further purification. What is called *refined sulphur* is that purified by distillation in a large cast-iron still, and condensed in a receiver kept cool. When the vaporised sulphur is condensed in a large chamber, it is obtained in the form of *sublimed sulphur*, or *flowers of sulphur;* but as the walls get hot, it melts and collects on the floor, and is run into cylindrical wooden moulds, from which, when cool, it is taken out as *roll* or *stick sulphur.* The residue left in the retort is a mixture of sulphur with various impurities. Under the names of *Black Sulphur*, or *Sulphur vivum* (commonly inquired for at the chemist's under the title of *Sulphur of Ivy*), it is used in veterinary medicine, and for the purpose of dressing mouldy hops. Sulphur is thrown down from certain of its compounds (as from a strong solution of a polysulphide of calcium, sodium, or potassium) by dilute hydrochloric acid; it falls as a grayish-white, very fine, light powder, known in the Materia Medica as *milk of sulphur*, or *precipitated sulphur.* For the method of obtaining sulphur from iron pyrites, we must refer the reader to Miller's *Inorganic Chemistry*, 2d ed. p. 154. The proceeding is usually conducted on a large scale, 2000 tons of pyrites being roasted at once, the roasting extending over five or six months, and the final result being about 20 tons of sulphur. The most common impurities met with in ordinary commercial sulphur are selenium and realgar (bisulphide of arsenic). Flowers of sulphur frequently exhibit a slight acid reaction, in consequence of a little sulphurous acid clinging to them. By rinsing them with water, this impurity is at once removed.

Sulphur is extensively employed in the arts and manufactures; as in the manufacture of matches, gunpowder, &c. When converted into sulphurous acid, it is employed as a powerful bleaching agent, and also for the destruction of insects, fungi, &c.; but its chief consumption is in the manufacture of sulphuric acid.

Sulphur forms two oxides, viz., sulphurous, or sulphurous anhydride (SO_2), and sulphuric, or sulphuric anhydride (SO_3): each of these when united with 1 atom of water forming, respectively, sulphurous acid ($H_2O.SO_2{=}H_2SO_3$) and sulphuric acid ($H_2OSO_3{=}H_2SO_4$). S. forms with oxygen seven acids:

Sulphurous acid,	H_2SO_3.
Sulphuric acid,	H_2SO_4.
Hyposulphurous, or Thiosulphuric acid,	$H_2S_2O_3$.
Hyposulphuric, or Dithionic acid,	$H_2S_2O_6$.
Trithionic acid,	$H_2S_3O_6$.
Tetrathionic acid,	$H_2S_4O_6$.
Pentathionic acid,	$H_2S_5O_6$.

The last five of these acids have never been obtained in the anhydrous form. We shall only notice the most important members of this group, viz., the first three of them, and of these, the second, *Sulphuric Acid*, is so extremely important, that it is discussed in a special article. (The last three derive the essential portion of their name from the Greek word *theion*, sulphur.)

SULPHUROUS ACID, or SULPHUROUS ANHYDRIDE (H_2SO_3), occurs under the ordinary relations of temperature and pressure as a colourless gas, possessing the suffocating odour of burning sulphur. In its concentrated form, it is quite irrespirable, and in a diluted state it excites cough, and produces the symptoms of an ordinary catarrh. It is not only incapable of burning, but it rapidly extinguishes the flame of burning bodies. It is very freely soluble in cold water, which at 32° takes up nearly 69 times its volume of the gas, while at 75° it only takes up 32 volumes; the solution known as *Aqueous Sulphurous Acid* having at first the same smell and taste as the gas, but soon absorbing oxygen from the air, and becoming converted into sulphuric acid. By the action of cold, sulphurous acid may be condensed to a colourless transparent limpid liquid, which freezes at −105°, forming a transparent crystalline solid. The specific gravity of the gas is 2·247 (atmospheric air being the unit), and that of the liquid is 1·49 (water being the unit), the solid being considerably heavier. Although dry sulphurous acid gas and dry oxygen, when mixed, exert no action on one another, there are many conditions under which sulphurous acid rapidly absorbs oxygen, and is converted into sulphuric acid. It has been mentioned that this takes place if the gas be dissolved in water; a similar action takes place under the influence of hydrated nitric acid, iodic acid, and certain metallic oxides. For example, oxide of lead, when immersed in the gas, burns and is converted into white sulphate of lead ($Pb_2O + HSO_3 = Pb_3 + SO_4$). Hence, sulphurous acid is a powerful reducing or deoxidising agent. This gas is a common and abundant product of volcanic action, and is occasionally met with in solution in the springs in volcanic regions. It may be prepared artificially by simply burning sulphur in the air, or in oxygen gas, or by heating in a flask 4 parts of flowers of sulphur mixed with 5 parts of powdered black manganese, sulphurous acid and sulphide of manganese being the products, as shewn by the equation $2S + Mn_2O_2 = SO_2 + Mn_2S$. In consequence of its solubility in water, this gas should be collected over mercury. In addition to the uses of sulphurous acid as a bleaching agent, it is valuable both as a disinfectant agent and as a powerful antiseptic; its latter property has been applied to the preservation of meat, which, after exposure to this acid, will keep fresh for years, if it be enclosed in metallic canisters filled with nitrogen, to which a little binoxide of nitrogen has been added, to remove any trace of oxygen. But by far its most important use is, as a first stage in the manufacture of sulphuric acid. In combination with bases, this acid forms the *sulphites*—a class of salts which, excepting the sulphite of sodium, are of little practical importance, except for their power, when moist, of extracting oxygen, and thus acting as reducing agents. For example, the salts of the sesquioxide of iron are reduced by them to salts of the protoxide.

HYPOSULPHUROUS ACID ($H_2S_2O_3$) is scarcely known in a state of combination with bases; for on attempting to separate the acid from the base, the former becomes almost immediately decomposed into sulphur and sulphurous acid. The most important of its salts is the *Hyposulphite of Sodium* ($Na_2S_2O_3.5H_2O$), whose mode of preparation and characters are described in the article SODIUM. This and other soluble hyposulphites may be easily recognised by the facility with which they dissolve the haloid salts of silver, forming a solution of an extremely sweet taste, and containing a double hyposulphite of silver and sodium, with an admixture of chloride, iodide, or bromide of sodium. It is this power of dissolving those salts of silver which are insoluble in water

that renders the hyposulphite of sodium so important an agent in photography. The only other salt of this acid which we shall notice is the *Hyposulphite of Gold and Sodium* ($AuNa_3S_4O_6.2H_2O$), which may be prepared by mixing concentrated solutions of 1 part of chloride of gold and 3 parts of hyposulphite of sodium, and adding alcohol, when the required salt is precipitated. It is used for gilding the daguerreotype plate, and for colouring the positive proof obtained in photographic printing.

With hydrogen, sulphur forms two compounds, viz., *Sulphuretted Hydrogen*, or *Hydrosulphuric Acid* (q. v.), and *Persulphide of Hydrogen*, an oily liquid, having the smell and taste of sulphuretted hydrogen, and in many of its properties having an analogy to binoxide of hydrogen. Sulphur combines with carbon to form a *Disulphide of Carbon* (CS_2), a very volatile colourless liquid, of a high refractive power, of an acrid and pungent taste, and a very disagreeable odour. It is heavier than water, in which it is insoluble, but dissolves freely in alcohol and ether, and is the best solvent for sulphur and phosphorus. Bisulphide of carbon does not occur as a natural product, but may be obtained by heating fragments of charcoal to bright redness in a porcelain tube, and passing sulphur vapour along it. Its vapour, when freely inhaled, exerts a similar anæsthetic action with those of chloroform and ether. Workmen in caoutchouc or other manufactures in which bisulphide of carbon is used as a solvent, suffer very much from prolonged exposure to its vapour, which produces headache, loss of appetite, impairment of vision and hearing, and causes general derangement of health by its deleterious action on the nervous system. Sulphur combines with chlorine in several proportions, the most important of these compounds being the *Disulphide of Chlorine* (Cl_2S_2) and the *Protosulphide of Chlorine* (Cl_2S). Both of them are liquids, and are formed by the direct action of the combining elements. The disulphide is a yellow volatile liquid with a penetrating and disagreeable odour. When dropped in water, it sinks to the bottom (its spec. grav. being about 1·687), and is slowly decomposed into hydrochloric and various sulphur acids, and free sulphur. It is capable of dissolving about 67 per cent. of sulphur at an ordinary temperature, and, like disulphide of carbon, is extensively employed in vulcanising india-rubber. By passing dry chlorine gas through disulphide of chlorine at various temperatures, liquids are produced containing various proportions of sulphur and chlorine both above and below those required by the formula Cl_2S, or protosulphide of chlorine.

With regard to the history of sulphur and its compounds, it may be observed that sulphur seems to have been known from the earliest times, and that sulphuric acid was most probably known to the Arabians. The manufacture of English sulphuric acid dates, however, only from the 18th century. Sulphurous acid was first investigated by Stahl, Scheele, and Priestley; hyposulphuric acid was discovered by Welter and Gay-Lussac; hyposulphurous acid, by Gay-Lussac and Herschel; trithionic acid, by Langlois; tetrathionic acid, by Fordos and Gelis; and pentathionic acid, by Wackenroder. Scheele was the first who accurately studied hydrosulphuric acid, or sulphuretted hydrogen.

Sulphur is used to a considerable extent and for very different purposes in medicine. It is given internally either as sublimed sulphur (flowers of sulphur) or as precipitated sulphur (milk of sulphur), in somewhat large doses, as a mild cathartic—its purgative effects being due to its stimulating the muscular coat of the intestines. In consequence of its being both gentle and sure in its action, it is the best purgative to employ in cases of piles or in stricture or other painful affections of the rectum. The only objection to its use is that, from its becoming partly converted in the system into sulphuretted hydrogen, the evacuations, and even the insensible perspiration, often become abominably fœtid, and continue so for some time after the primary operation of the medicine. As a purgative, the dose is about two drachms, made into an electuary with treacle or honey. It is, however generally combined with jalap and cream of tartar.

The *Confection of Sulphur* of the Pharmacopœia is composed of sulphur, cream of tartar, and syrup of orange-peel rubbed together—the dose being from half an ounce to an ounce, or from one to two tablespoonfuls. In small doses, sulphur is of great value in cases of atonic gout and chronic rheumatism. An electuary known as *The Chelsea Pensioner*, consisting of two ounces of sublimed sulphur, one ounce of powdered rhubarb, half an ounce of resin of guaiacum, one ounce of cream of tartar, half an ounce of ginger, and two drachms of powdered nutmegs, with as much treacle as is necessary, in doses of one or two teaspoonfuls night and morning, is a combination of great value in these cases. It originally gained its reputation by curing Lord Amherst of rheumatism, and is still a favourite remedy at Chelsea Hospital. Dr Neligan states that steaming the lower bowel, by sitting over the vapour of warm water upon which a tablespoonful of flowers of sulphur had been sprinkled, constitutes a most valuable remedy in what is popularly known as a 'fit of the piles.' The external use of sulphur in the form of ointment has been already noticed in the article ITCH. It is also used externally in many other cutaneous disorders, particularly in lepra and psoriasis; and in chronic cases, its application in the form of vapour is often of great service.

SULPHU'RIC ACID, or, more correctly, Hydrated Sulphuric Anhydride (H_2SO_4), is the chemical name of the liquid commercially and popularly known as *Oil of Vitriol.** It is a dense, colourless, oily liquid, without smell, of a spec. grav. of 1·846 at a temperature of 60°, and of an intensely acid taste and reaction. It has a powerful caustic action, and chars and destroys organic matters from its strong affinity for water; and in consequence of this destructive property, it must always be handled with the greatest caution. So powerful is this affinity, that if the acid be exposed for a few days to the air in a shallow dish, so as to present a large surface, it often doubles its weight by absorbing aqueous vapour from the air; and in consequence of its possessing this property, it is extensively used in laboratory operations as a desiccating agent. It mixes completely with water in all proportions, and as great heat is given out at the moment of mixture, the dilution should be performed by very gradually adding the acid to the water. When cold, the mixture occupies less bulk than the two components previously occupied. This acid freezes at a temperature of $-15°$, and boils at 620° (or according to Marignac, at 640°), and just above the boiling-point, it assumes the form of a vapour, with a spec. grav. of 2·15. There are two, if not more, well-defined hydrates of sulphuric acid, namely, the monohydrate ($H_2SO_4.H_2O$) and the dihydrate ($H_2SO_4.2H_2O$). The first has a spec. grav. of 1·78, and solidifies at 46½° to 48° F., forming a mass of colourless, six-sided prisms, whence it is called glacial sulphuric acid. It boils at 392°—410° F.,

* It received this name from having been first produced by the distillation of green vitriol (sulphate of iron); Basil Valentine being usually credited with the discovery. See ALCHEMY.

giving off a weak acid vapor. It may be obtained by evaporating any dilute sulphuric acid at a temperature of 392° F. until it ceases to lose water. The second hydrate results from the mixture of 1 atom of oil of vitriol with 2 atoms of water. This preparation corresponds to the maximum condensation, nearly 8 per cent., which results from the union of the acid with water. Its spec. grav. is 1·62; and its boiling-point 348° F. It may be obtained by evaporating any dilute acid at 212° F. until it ceases to lose water.

Fuming sulphuric acid, known as *Nordhausen* or *Saxon*, is distilled from dehydrated sulphate of iron. It is a heavy, brown, oily liquid, having a spec. grav. of 1·9 and a composition corresponding nearly to the formula $H_2S_2O_7$ or $H_2SO_4.SO_3$. It solidifies at 32° F. into colourless, transparent crystals, and when gently heated breaks up into sulphuric oxide (SO_3), which distils over, and sulphuric acid (H_2SO_4), which remains. For a notice of anhydrous sulphuric acid, which is not properly an acid, see SULPHURIC ANHYDRIDE.

Sulphuric acid in its free state is a very rare natural product; although, in combination with bases, it is common in the animal and vegetable, and abundant in the inorganic kingdom. The only cases in which it is known to occur free are certain American rivers, especially the Rio Vinagre, and some lakes in Tennessee and in Java; and it has been found to be a normal constituent of the saliva of *Dolium galia*, a species of snail found in Sicily. In all these cases, the acid is, of course, in an extremely diluted form. In plants it exists in the juices, and in animals in the blood and its derivates chiefly in the form of sulphates of the alkalies; while in the mineral kingdom it occurs as gypsum (sulphate of calcium), heavy spar (sulphate of barium), celestine (sulphate of strontium), &c.

Sulphuric acid may be prepared on a small scale by boiling sulphur in *aqua regia*, or in nitric acid, the sulphur becoming gradually oxidised into sulphuric acid. As a general rule, however, the commercial acid is employed even for laboratory experiments. See below.

In order to obtain the acid in a pure form, suitable for medical use or medico-legal analyses, it must be redistilled with sulphate of ammonia in a retort containing a few slips of platinum foil, the first and last portions being rejected. The distillation is attended with violent concussions, partly owing to the high specific gravity of the acid, and partly owing to its high boiling-point, and this convulsive action is moderated mechanically by the platinum slips. Sulphuric acid thus prepared according to the directions of the British Pharmacopœia may be regarded as perfectly pure, presuming arsenic is not present. Strong sulphuric acid has comparatively little action on the metals except at a high temperature, when it dissolves them, and, at the same time, undergoes partial decomposition; the metal being oxidised by a portion of the acid which becomes decomposed into oxygen and sulphurous acid, and then uniting with a portion of undecomposed acid to form a sulphate. Silver, copper, mercury, arsenic, antimony, bismuth, tin, lead, and tellurium are thus acted on. Gold, platinum, rhodium, and iridium are not affected by the acid even at a boiling temperature. The more oxidisable metals, such as zinc, iron, nickel, and manganese, are readily soluble in the dilute acid, water being decomposed, and hydrogen liberated, while the oxygen of the water unites with the metal; and the metallic oxide, at the moment of its formation, combines with the sulphuric acid to form a sulphate.

The *sulphates*—or salts formed by the combination of sulphuric acid with a base—are generally composed, as in the case of green vitriol ($Fe_2SO_4.7H_2O$), of 1 equivalent of acid and two of the metal, with or without water of crystallisation. With the alkalies, this acid also forms acid salts, as bisulphate of potassium, and in a few cases—copper, for example—it forms basic salts. The insoluble sulphates, such as that of barium, may be obtained by precipitating a soluble salt of the base by a soluble sulphate; thus, nitrate of barium and sulphate of sodium yield an insoluble sulphate of barium and nitrate of sodium, which remains in solution. The soluble sulphates may be prepared by dissolving the oxide or carbonate in dilute sulphuric acid, in those cases in which the metal itself is not readily attacked by the acid. Sulphuric acid and the soluble sulphates are easily detected by their yielding, with a solution of a barium salt, a white precipitate of sulphate of barium insoluble in acids.

This acid is employed in the arts and manufactures for a large number of purposes. Its use as a desiccating agent for laboratory purposes has been already noticed, and its application to the development of oxygen gas has been described in the article on that element. But its greatest consumption, doubtless, is in the preparation of the *Salt-cake*, which is used in the manufacture of Carbonate of Soda (q. v.).

In medicine, a *dilute sulphuric acid*, formed by gradually mixing three fluid ounces of the strong purified acid with thirty-five fluid ounces of water, or *aromatic sulphuric acid* (known also as *elixir of vitriol*), prepared by mixing three ounces of sulphuric acid with a quart of rectified spirit, adding cinnamon and ginger, digesting for a week, and filtering, are almost always employed. In doses of from ten to thirty minims, properly diluted, these preparations exert a strong astringent power, and are serviceable in all forms of passive hæmorrhages, and in checking inordinate discharges when they arise from debility. In ordinary diarrhœa, and even in the premonitory diarrhœa of cholera, dilute sulphuric acid is of great use. In painters' colic, it is given in order to convert any lead that is absorbed into an insoluble sulphate, which is inert. Sulphuric acid lemonade is also used as a prophylactic against the disease. As this acid exerts a deleterious action on the teeth, it should be directed to suck it through a quill. In some cases, it is prescribed not so much for its specific as for its solvent power; with this object, it is usually prescribed with quinine. The strong acid is used in surgery as a caustic. In cases of *poisoning* with this acid, the most prominent features are: burning pain extending from the mouth to the stomach, intense pain in the bowels, vomiting, great prostration, coldness of the surface, and fœtor of the breath. The mucous membrane of the parts injured by the acid is at first converted into a white slough, which soon becomes black, and the patient usually dies from exhaustion within twenty-four hours. The best antidotes are the alkaline bicarbonates, or carbonate of magnesium. If the primary symptoms be conquered, the patient often dies subsequently from stricture of the œsophagus.

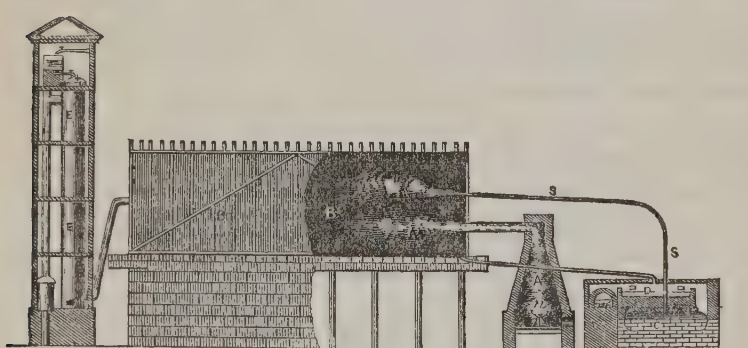
Sulphuric Acid Manufacture.—There are two distinct processes by which sulphuric acid is at present prepared on a large scale—viz., by the distillation of green sulphate of iron—the original process of Valentine; and by the oxidation of sulphurous acid through the agency of nitrous acid and hyponitric acid. The first process is chiefly employed at Nordhausen, in Prussia, and is thus described by Fownes: 'The sulphate of iron, derived from the oxidation of iron pyrites, is deprived by heat of the greater part of its water of crystallisation, and subjected to a high heat in earthen retorts, to which receivers are added as soon as the acid begins to distil over. A part gets

decomposed by the very high temperature; the remainder is driven off in vapour, which is condensed by the cold vessel containing a very small quantity of water or common sulphuric acid. The product is a brown oily liquid of about 1·9 specific gravity, fuming in the air, and very corrosive. It is chiefly used for the purpose of dissolving indigo.'

The second method is that universally followed in Great Britain, the germs of which were likewise discovered by Valentine. He observed that when the fumes of burning sulphur were collected under a bell jar, slightly moistened with water, a small quantity of liquid was deposited. This liquid, which was simply sulphuric acid, on being concentrated from its solution by boiling, was long sold as oil of sulphur *per campanum* at prices as high as 2s 6*d*. per ounce.

About the year 1740, the French chemists Lefevre and Lemery suggested that, by the use of nitre along with the sulphur, the operation might be conducted in close vessels, and a much greater quantity of acid might be produced. This idea was acted on in England by a Dr Ward, who established works at Twickenham and Richmond, conducting his manufacture by burning the mixed sulphur and nitre in large stoppered glass receivers, into each of which a small quantity of water was first introduced. The substitution, by Dr Roebuck of Birmingham, of lead chambers in place of the glass vessels, may be regarded as essentially the establishment of the process of manufacture followed at the present day. Dr Roebuck established his first works at Prestonpans in 1749.

The first stage in the manufacture of sulphuric acid is the preparation of sulphurous acid by the burning of sulphur or of iron pyrites. Previous to the year 1838, Sicilian sulphur was almost exclusively used in the manufacture, but in that year, the very ill-advised establishment of a monopoly of the sulphur trade by the Sicilian government, and its consequent increase in price, diverted the minds of manufacturers to the employment of iron pyrites (sulphuret of iron) the use of which, as a source of sulphurous acid, was already not unknown. The monopoly was quickly abolished, on the representations of the English government, but not until it was demonstrated that the world was independent of Sicily both for sulphuric acid and sulphur. Iron pyrites is now much more used than sulphur, and the only hindrance to its universal adoption is the presence of foreign matter in the pyrites, the most deleterious being arsenical compounds; and it has hitherto been found impracticable to free the sulphuric acid wholly from the arsenious acid which



Manufacture of Sulphuric Acid:
A, sulphur-burner, or furnace; B, lead chamber, shewn in section at B′; C, steam boiler; D, leaden pan; E, coke tower; S, steam-pipe; *n*, nitre pot.

consequently accompanies it. This renders the acid prepared from pyrites inapplicable for many purposes.

When sulphur is the material used for producing the sulphurous acid, it is burned in an oven or 'burner' (A) of brick-work, having a sole or bottom of iron, termed the 'burner-plate.' Under this, a small fire is at first lighted, which is allowed to go out after the sulphur has ignited. A little above the sulphur, a small pot, called the nitre pot, *n*, is either placed on a stand, or hung from the roof, filled with a quantity of either nitrate of soda or nitrate of potash, with sulphuric acid sufficient for its decomposition—8 or 10 lbs. of the nitre, with 5 or 6 lbs. of sulphuric acid, being allowed for every cwt. of sulphur. The decomposition of the nitre by the action of heated sulphuric acid, furnishes nitric acid fumes, which go over into the chamber along with the sulphurous acid. The sulphurous readily abstracts from the nitric acid the additional equivalent of oxygen required for its conversion into sulphuric acid, reducing the nitrous compound from nitric acid, HNO_3, to nitric oxide, NO. Nitric oxide in its turn quickly converts itself into nitric peroxide, NO_2, by the abstraction of an additional equivalent of oxygen from the air that is constantly entering the chamber through the burners. Again, in the presence of moisture which is supplied by a jet of steam from the boiler C, sulphurous acid readily deprives the nitric peroxide of 1 equivalent of oxygen, and thus forms another volume of sulphuric acid, and again liberates nitric oxide. The reaction may be expressed as follows, $NO_2 + SO_2 + H_2O = H_2SO_4 + NO$. The nitric oxide is again ready once more to seize upon the oxygen of the air, and would continue so acting and reacting ***ad infinitum***, were it not carried forward and out by the chimney provided for the escape of the freed nitrogen.

The chamber is an immense box or room of lead, bound together with a strong framework of timber, and generally raised on arches several feet above the ground. Chambers vary in size from 60 to 140 feet in length, and from 20 to 40 feet in width and height. Curtains of lead proceeding alternately from the bottom to near the top, and *vice versâ*, are very frequently used; they serve to retard the progress of the gases, and thus insure the transformations desired. The floor of the chamber is covered with water, into which the sulphuric acid falls as it is formed; and when this solution attains a certain strength, it is tapped off for concentration. When the gases reach the chimney, on account of the reactions of the nitrous compounds already explained, a large amount of nitrous acid would not only be wasted, but would also be deleterious to the neighbourhood, were steps for its recovery not adopted. This recovery is usually effected by means of a tower filled with coke, E, down which a constant stream of strong sulphuric acid trickles, the acid absorbing the nitrous fumes in their way upwards. Instead of a single chamber, curtained off or not as the case may be, sometimes three or five distinct chambers, connected by pipes, are employed, thus

communicating directly with the burners being termed working chambers, and the others receiving chambers, the last either acting as or communicating with a condenser or chimney. In France and Germany, the apparatus employed is generally of a more complicated nature, but in principle the operations are identical.

When iron pyrites is used as the source of sulphurous acid, a furnace somewhat on the principle of the ordinary lime-kiln is required. The pyrites is broken into pieces like nuts, washed, and spread in layers on plates heated to redness, and frequently stirred; or a quantity of coke is introduced with the first charge, and the heat evolved by the burning sulphur is thereafter sufficient fuel for the fresh charges. The exhausted ore is frequently sufficiently rich in copper for its extraction; indeed, when there is not more than 2½ per cent. of that metal present in pyrites, it is now recovered, and this has led to the establishment of copper-smelting works in connection with great chemical works near Newcastle and Manchester. The large chambers required, the increased labour, the greater quantity of nitre wasted, and other circumstances, tend to make the cost of acid from both sources nearly equal. *Alkali waste* from the soda works, consisting of sulphide of calcium, sulphide of sodium, &c., is also employed for the reproduction of sulphur and sulphuric acid.

In consequence of strong sulphuric acid absorbing both sulphurous acid and nitrous acid, the acid requires to be drained off from the chamber while the solution is comparatively weak, at which strength, viz., of a specific gravity of about 1·4, it is used for some purposes in the arts, under the name of 'Chamber Acid.' This is concentrated by evaporating, in leaden pans, D, till it reaches the specific gravity of 1·6, then boiling in a platinum retort, on which strong acid does not act, even at high heat, or in large flint-glass retorts. A platinum retort has been made for the concentration of 8 tons of acid per day, and valued at £2500. Large glass retorts, which were used before the introduction of the platinum retorts, are again coming into favour with manufacturers. The only objection to their use is the great expense arising from frequent breakages, and consequent loss of both acid and retort.

The manufacture of sulphuric acid is a very extensive industry; immense quantities of it being consumed in the manufacture of soda, in that of bleaching-powder, in calico-printing and dyeing, and, in fact, in most chemical operations both in the manufactory and the laboratory. For details respecting the manufacture of sulphuric acid, see Richardson and Watts's *Chemical Technology*, vol. i., and for popular views of modern processes, J. Lawrence Smith's *Progress and Condition of Industrial Chemistry*, in *Rep. of United States Commissioners to the Paris Exhibition*, 1867, Washington, 1869.

SULPHURIC ANHYDRIDE, formerly known as ANHYDROUS SULPHURIC ACID, is commonly represented by the formula SO_3, but reasons have been advanced for believing that the formula should be doubled—or, in other words, that it is a compound of two atoms of sulphur with six of oxygen. It is a colourless crystalline solid, which is tough and ductile, and can be moulded in the fingers like wax without injuring the skin. It liquefies at 65°, and boils at about 95°, forming a transparent vapour, if hot water be present. It unites with moisture when exposed to the air, and gives off dense white fumes. When thrown into water, the heat emitted is so great that it hisses as red-hot iron would do; and the solution has all the properties of ordinary sulphuric acid. It may be obtained by the distillation of fuming Nordhausen acid, when white fumes pass over in the cooled receiver and solidify into a white silky-looking fibrous mass. It may be also obtained by the distillation of acid sulphate of soda ($Na_2O.2SO_3$), after it has been deprived of its atom of water. It combines with sulphur, iodine, and hydrochloric acid; but both it and its compounds are objects of chemical interest rather than of practical value.

SULPHURIC ETHER is a term commonly but improperly applied to ethylic, vinic, or ordinary Ether (q. v.). True *sulphuric ether*, known also as *sulphate of ethyl* ($(C_2H_5)^2SO_4$), is an oily liquid of burning taste and ethereal odour, resembling that of peppermint, of specific gravity 1·120 (while that of ordinary pure ether is 0·720), and almost incapable of being distilled without decomposition, as at a temperature of about 280° it resolves itself into alcohol, sulphurous acid, and olefiant gas.

In the article ETHER, reference is made to the anæsthetic properties of that compound. Dr Richardson discovered in 1866 that local insensibility may be readily induced by the application to the skin of the finely divided spray of perfectly pure rectified ether, of specific gravity 0·723. The skin blanches in from half a minute to two minutes; and by following the knife with the spray, more than merely superficial incisions may be rendered painless. It has been successfully employed in numerous operations, including amputations of fingers and toes, removal of tumours and teeth, opening of abscesses, &c.

SULPHUROUS ACID. See SUPP. in Vol. X.

SU'LTAN, or SULTAUN, an Arabic word, signifying 'mighty man,' and evidently closely connected with the Hebrew word *shalal*, to rule, is in the East an ordinary title of Mohammedan princes. It is given, *par excellence*, to the supreme head of the Ottoman empire; but is looked upon as a less dignified title than that of Padishah (q. v.). It is applied in Egypt to the ruler of that country, and is also retained by the heir of the former reigning line of the Crim-Tartars. *Sultana* is the title of the wife of a sultan.

SULU ISLANDS, an archipelago of about 60 islands in the Mindoro Sea, between the Philippines and Borneo (q. v.). Cagayan Sulu, the chief of the islands, 36 miles long and 12 broad, contains the town of Soong, the residence of the sultan of the group. See PHILIPPINE ISLANDS.

SU'MACH (*Rhus*), a genus of small trees and shrubs, of the natural order *Anacardiaceæ;* having small inconspicuous flowers in panicles or in corymbs; a 5-parted calyx, 5 petals, springing from beneath a large orbicular disk; 5 stamens; a 1-celled germen with three stigmas; the fruit a small, nearly dry drupe, with bony *putamen.* The species are numerous, diffused over almost all parts of the world, except its coldest regions and Australia; and some of them, on account of peculiar principles which they contain, are of importance in the arts and in medicine; some are remarkable for their poisonous properties.—VENETIAN S. (*R. cotinus*), known also as Wig S. or Mist Tree, is a native of the south of Europe and west of Asia, and is often planted in America as an ornamental shrub. It has simple leaves, and hairy corymbs of fruit, which have a sort of resemblance to periwigs. The wood dyes yellow, and, with the addition of other substances, green and brown, and is known in trade by the name of *Young Fustic.* It is largely imported into the United States. The bark is sometimes used as a substitute for Peruvian Bark. The leaves are astringent, and are used in dyeing Turkey Red. The root is also used in dyeing, and the whole plant is used in Italy for tanning, and is there called *Scotina.* The seed resembles the almond in flavour. — The very acid fruit of the ELM-LEAVED S. (*R. coriaria*) — a native of the countries around the

Mediterranean, with pinnate leaves, not unfrequent in British shrubberies—has been used from the earliest times, as it still is by the Turks and Persians, as a condiment with different kinds of food. Both the seeds and the leaves are used medicinally, in the south of Europe and the East, as tonic and cooling. This species is also extensively

Sumach (*Rhus cotinus*), shewing leaves, flowers, and fruit.

used for tanning, particularly in Turkey and in Spain. The leaves and twigs are used for dyeing black, the roots and fruit for dyeing red, and the bark for dyeing yellow.—Similar to this in its properties and uses is the VIRGINIAN S., or STAG'S-HORN S. (*R. typhina*), a native of almost all parts of North America, and common in British shrubberies, which has the branches curiously crooked, and covered, when young, with a soft velvety down. It has pinnate leaves, with numerous leaflets.—The SMOOTH-LEAVED S. (*R. glabra*), a very similar species, also North American, has very acid leaves, which are eaten by children, and are used in domestic economy and in medicine on account of the malic acid which they contain. The bloom of the fruit is also very acid. This species is sometimes troublesome in North America, overrunning ground as a weed.—Of the acrid and poisonous species, the most important is the POISON OAK or POISON IVY (*R. toxicodendron*) of North America, a shrub with leaves of three leaflets, when erect 2 to 6 feet high, or climbing trees, when it is known as *R. radicans*, and reaching a length of 30 to 40 feet. The leaves are used in medicine in cases of paralysis, amaurosis, and other nervous affections, as a stimulant of the nervous system, also in chronic rheumatism, and obstinate eruptions; but are efficacious only when fresh, as the poisonous substance is volatile. Similar to this in properties are the POISON ALDER, or POISON S. (*R. venenata*), also known as POISON DOGWOOD, and other North American species, the juice of which is very acrid, and even the emanations are injurious to some persons, who, from remaining a short time near these plants, or from handling them, experience swelling of the whole body, with subsequent inflammation of the skin, pustules, and violent itching, whilst it is remarkable that others appear quite unsusceptible of their influence.—The VARNISH S., or JAPAN VARNISH TREE (*R. vernicifera*), a native of Japan and Nepaul, yields a varnish much used in Japan for lacquer-work. This varnish is the juice which flows from wounds in the tree, and which becomes thick and black by exposure to the air, but is still so transparent that the finest veins of wood varnished with it may be seen through it. It is sometimes mixed with colouring matters, sometimes with gold-leaf finely ground. The expressed oil of the seeds becomes as hard as tallow, and is used for candles.

The name TANNERS' S. is given to *Coriaria myrtifolia*, a shrub of the south of Europe, of the natural order *Ochnaceæ*. The leaves are astringent, and are used for tanning, and for dyeing black.

SUMA'TRA (called by the Arabians *Srimat* or *Srimata*, 'the happy,' whence its present name), the most westerly of the Sunda Islands, lies south of the Malay Peninsula, from which it is separated by the Strait of Malacca. Lat. between 5° 45′ N. and 5° 50′ S. It is 1040 miles long and 266 miles in extreme breadth; area, 168,000 sq. m.; pop., including that of the adjacent isles, 7,000,000, fully one half of whom were directly or indirectly under Netherlands rule until Nov. 1871, when these settlements were sold to Great Britain.

Physical Features.—The Barisan Mountains run throughout its entire length, varying in altitude from 1550 feet in the south-west to 6000 under the equator. Lofty cones, of which about 20 are volcanoes, attain to from 6000 to upwards of 10,000 feet. Another series of mountains runs parallel with the Barisan, lofty plateaux of great extent linking them together at various points. On the west coast, a few miles of low land lie between the mountains and the sea, in some parts spurs reaching the shore in beetling cliffs. Wide alluvial plains, covered with dense jungle and forest, through which the rivers run sluggishly, forming deltas at their mouths, stretch along the north-east coast; while the tidal action is eating into the west coast, new ground is forming on the east.

Extensive valleys lie between the mountain chains. Several beautiful lakes are scattered over the interior. The largest is Lake Singkarrah or Semaway, in Upper Padang, 17 miles long and 6 broad. It is 1167 feet above the sea, and discharges its waters by the Ombilin, which, flowing eastwards, becomes the Indragiri.

The mountain systems are of trachyte, granite, limestone, red sandstone, and a wide-spread conglomerate composed of granitic and quartzose particles, the hollows in many places being filled with lava. Sienite, porphyry, serpentine, jasper, basalt, and tufa occur. Tertiary deposits are found in the valleys, and in some parts of the coasts a rich vegetable mould rests on beds of red and grey clay, or on coralline limestone. Potter's clays are met with, and gold is widely diffused. Coal, iron-ore, copper, sulphur, lead, silver, saltpetre, alum, naphtha, &c., abound.

Rivers.—S. has many rivers, the most important being the Tūlang-Bawang; the Mūsi, or river of Palembang; the Djambi, Indragiri, and Siak, on the east; the Singkel, Tabūjong, Indrapūra, Moko Moko, Bencoolen, and Padang Gūtjie on the west. The capes and bays are numerous, the Bay of Tapanūli being capable of containing a large fleet. A chain of islands lies parallel to S. in the Indian Sea. The most important are—Babi or Si Malu, Nias (q. v.), the Batū Islands, North Pora, Coco Island, South Pora, North Pagei, and South Pagei. To the south-east lies Banca, rich in tin, producing also iron, lead, silver, copper, arsenic, and amber.

Climate.—The climate of S. is moderately healthy, especially on the east coast. In Tapanūli, however, are large marshes, inducing intermittent and typhoidal fevers, dysentery, and other diseases. A

slight increase of temperature takes place from October to March, the minimum being in May. Except in the highlands of the interior, where it is cool, the thermometer ranges from 70° F., at sunrise, to 94° at 2 P. M. The monsoons are irregular, and rain falls during all the months, though the quantity in October and December is double that in February and June.

Flora.—S. has many fine species of timber trees —as the Djati (*Tectona grandis*), the Maris, a hard and heavy wood, ebony, iron-wood, &c. The magnificent *Dryobalanops camphora*, and other resin-producing trees, are abundant. Several species of fig, the *Urceola elastica*, from which caoutchouc is obtained, and the gutta-percha tree (*Isonandra gutta*), are numerous. In the villages, the Bombax, or silk-cotton tree, forms a shady resting-place at noon. The lovely *Cinnamomum cassia*, the *Melaleuca leucadendron*, which yields the medicinal cajeput oil, the satin-wood (*Chloroxylon swietenia*), the gigantic reed (*Calamus draco*), from the ripe fruit of which the dragon-blood gum exudes, and a great variety of palms, form part of the botanical wealth of the island. Flowering plants and shrubs are numerous, and countless parasites garland the forest trees with flowers of every hue. The most curious of these is the *Rafflesia* (q. v.), which, clinging to the bark of large trees, spreads out the largest known flower, with a calyx 3 feet in diameter and 9 inches deep.

The fruits are richer in flavour than those of Java. Among these are the guava, citron, oranges, lemon, durian, mango, bread-fruit, cocoa-nut, pomegranate, water-melons, pine-apples, and the highly-prized mangosteen, or berry of *Garcinia mangostana*. Cacao, cotton, maize, indigo, tobacco, gambier, and more especially rice, millet, pepper, and coffee, are cultivated.

Fauna.—The elephant, single and double horned rhinoceros, tiger, leopard, black bear and tiger-cat, wild swine, tapirs, antelopes, deer, monkeys (including the ourang-outang), ant-eaters, many kinds of bat, &c., abound. Buffaloes, cows, goats, horses, sheep, and swine are kept by the natives. The peacock and the pheasants of S. are of rare beauty. Hippopotami and crocodiles frequent the rivers, which have many kinds of fish, including a species of salmon.

Geographical and Political Divisions.—The independent kingdom of Acheen extends from the north-west point to 97° 40′ E. long.; area, 2260 sq. m.; pop. variously given from 450,000 to 2,000,000; is well cultivated, and produces much pepper. Singkel, Tapanūli, and Lower Padang, until quite recently under the Netherlands residency of Padang, lie in succession to the south-east of Acheen. The interior, including the once-powerful kingdom of Menangkabou, is governed by the resident of Upper Padang. Bencoolen stretches along the west coast from 101° tc 104° 40′ E. long.; and the extreme south and the east coast, between 4° 4′—5° 56′ S. lat., form the Lampong districts. North of these is the residency of Palembang, with the kingdom of Djambi, which has been ruled over by a native prince under Dutch control. Farther north are Indragiri, Kampar, and Siak, governed as Djambi. Between Siak and Acheen are many petty states of little importance.

People.—The natives are chiefly Malays who profess Mohammedanism. In appearance, manners, and customs, however, the inhabitants of Acheen and the Lampongs differ widely from those of other parts. The Acheenese are tall, well-made, active, and intelligent, but cunning, proud, treacherous, and blood-thirsty. They live simply, but are slaves to opium. The Lampongers are of middle stature, well formed, of pleasant exterior, mild, but uncivilised and lazy. Caste prevails, and they follow the usages of their fathers, Mohammedanism being imperfectly known and practised. Polygamy obtains, the wives being bought from their relatives. The houses are on posts of iron-wood, several families living under the same roof. In other parts of S. the usual Malay type is found. The Kūbūs, in the north-west of Palembang, are probably the remains of the aborigines, a harmless race who live chiefly by the chase and fishing. Theft and murder are scarcely known among them. They believe in an after spirit-life.

Trade and Produce.—The imports and exports of the independent and half-independent kingdoms cannot be ascertained. Acheen alone produces 7000 tons of pepper annually, and also exports gold, precious stones, cotton, raw silk, sapan wood, benzoin, camphor, sulphur, betel, &c., to the west of India by way of Pūlū Penang and Singapore, receiving in return manufactured goods, salt, opium, &c. In 1862, the imports from Java amounted to £450,000; the exports to Java to £255,000. The trade direct with Europe and the countries of the East probably exceeds that with Java. Imports—rice, cotton and other textile fabrics, articles of taste, provisions, tobacco, &c.; exports—benzoin, gum elastic, resin, pepper, ratans, cotton, coffee, drugs, ivory, dye-stuffs, edible nests, wax, tobacco, bêche-de-mer, &c.

The rice-culture forms one of the chief sources of prosperity, the west coast producing 193,000 tons in 1862. The coffee yield amounted to 9322½ tons. Upper Padang sent the largest quantity of coffee and rice, with much cocoa-nut oil, to the market.

History.—Marco Polo visited S. in the 13th c., Alvaro Talezo in 1506, and Siquera in 1509, the Portuguese then entering into trading relations with the natives. About 90 years later, the Dutch under Houtman reached the island, and on a second visit he was treacherously murdered at Acheen. In 1601, two ships from Zeeland, with the Netherlands commissioners, General De Roi and Laurens Bikker, arrived, were favourably received by the king, obtained a full cargo, and returned with two Acheenese ambassadors. Later, the Dutch drove the Portuguese from their factory at Pūlū Tjinko, to the south of Padang; and in 1666, the latter place became the seat of the Netherlands power on the west coast. In 1795 Padang was taken by the British, and retained till 1819. A few years after, Bencoolen was also given up to the Dutch, and the southern division of the island soon fell under the same rule. Various rebellions against the Netherlands dominion have since arisen, with the uniform result of extending the power of the Dutch towards the interior and the north. In September 1865, an expedition was sent to force the king of Asahan, one of the small states on the north-east coast, to submit to their authority. In November, 1871, a convention was signed for the sale of the Dutch settlements in Sumatra by the representatives of the Dutch and English governments.—See *Flora van Nederlandsch Indie*, door F. A. W. Miquel (Amst. and Leip. 1855)

SUMBA'WA, one of the chain of islands to the east of Java, lies between 8° 4′—9° 2′ S. lat., and 116° 50′—119° 15′ E. long., is now divided into the kingdoms of Sumbawa, Bima, Dompo, and Sangar, each governed by its own sovereign. Area, 5838 square miles. Pop. nearly 100,000. The island is mountainous, but except the volcano Tambora, which is 9522 feet, the elevation does not exceed 5660. The most valuable timber-tree is the Djati (*Tectona grandis*, or Indian teak), and the tamarind is so abundant as to be little valued. Rice is extensively grown. Sapan-wood is contracted for with

the princes, by the Netherlands colonial government.

The natives of S. belong to the Malay race, but speak three different languages. They are inoffensive and industrious; murder, robbery, and theft being almost unknown. Many of them are Mohammedan, but the mountaineers are chiefly heathen, with an idea of a supreme being. Ancient relics recently found in Bima, indicate that they were formerly professors of Hinduism.

In 1815, an eruption of Tambora depopulated the kingdoms of Tambora and Papekat, 12,000 lives being lost, and great damage done to the whole island by the ashes. Another took place in 1836, and one of Gunong Api, in Bima, in 1860, but with little loss.

SU'MBUL (see MUSK PLANT) has been extensively employed for some years past, both in Great Britain and in America, in the treatment of epilepsy, hysteria, and other diseases of the nervous system. It has a musk-like odour, and an aromatic and somewhat bitter taste. It may be given in the form of infusion, tincture, or resin.

SU'MMARY DILIGENCE, in the practice of the law of Scotland, means issuing execution without the formality of an action, as a creditor enforcing payment of a bill of exchange or of a bond.

SUMMER, a horizontal beam, called also Breast Summer.

SUMMER DUCK, or WOOD DUCK (*Dendronessa sponsa*, or *Aix sponsa*), a very beautiful species of duck, of the section having the hind-toe destitute of membrane, a native of North America. It is found during the breeding season in almost all parts of the United States, and as far north as Nova

Summer Duck (*Dendronessa sponsa*).

Scotia, migrating southwards in winter, when it abounds in Texas and Mexico, but some remain during winter even in Massachusetts. It has been found capable of domestication.—Very similar to it is the MANDARIN DUCK (*Dendronessa* or *Aix galericulata*), a Chinese species. Both of these species have the power of perching on trees. The S. D. makes its nest in the hollow of a tree.

SUMMER ISLANDS, a small archipelago of islets off the west coast of Scotland, near the entrance of Loch Broom, an inlet in the north-west of the county of Ross. The islets are about 20 in number; and the largest of them, Tanera, two miles long, and a mile broad, and containing a pop. of 98, is the only one inhabited.

SU'MMONS, in English Law, means generally a writ directed to a party to appear and answer some complaint before a court or judge. It is the first writ in an action at law; and a similar writ issues incidentally both in Chancery and in interlocutory matters. It is also the first step in proceedings before justices.

SUMNER, CHARLES. See SUPP. in Vol. X.

SU'MPTUARY LAWS (Lat. *sumtus*, expense) laws passed to prevent extravagance in banquets, dress, and private expenditure. They abound in ancient legislation. The Locrian legislator, Zaleucus, 450 B. C., ordained that no woman should appear in the streets attended by more than one maid-servant, unless she were drunk, or wear gold or embroidered apparel, unless she designed to act unchastely. At an early period in Roman history, the Censors, to whom was intrusted the superintendence of public and private morality, punished with the *notatio censoria* all persons guilty of luxurious living, but as the love of luxury grew with the increase of wealth and foreign conquest, various legislative enactments were passed with the object of restraining it. The Lex Orchia, 161 B. C., limited the number of guests to be present at a feast; the Lex Fannia, 161 B. C., regulated the cost of entertainments, enacting that the utmost sum which should be expended on certain festivals was to be 100 asses, 30 asses on certain other festivals, and 10 asses on an ordinary entertainment, where also no other fowl than one hen was permitted to be served up, and that not fattened for the purpose. There were also the Lex Didia, Lucretia, Cornelia, Æmilia, Antia, Julia, and others, most of them passed in consequence of the practical disregard of the similar laws that had preceded them; but they all seem to have been habitually transgressed in the later times of the Republic.

Sumptuary laws were in great favour in the legislation of England from the time of Edward III. down to the Reformation. Statute 10 Edward III. c. 3, narrates, that 'through the excessive and over-many costly meats which the people of this realm have used more than elsewhere, many mischiefs have happened; for the great men by these excesses have been sore grieved, and the lesser people, who only endeavour to imitate the great ones in such sorts of meat, are much impoverished, whereby they are not able to aid themselves, nor their liege lord, in time of need, as they ought, and many other evils have happened as well to their souls as their bodies;' and enacts that no man, of whatever condition or estate, shall be allowed more than two courses at dinner or supper, or more than two kinds of food in each course, except on the principal festivals of the year, when three courses at the utmost are to be allowed. All who did not enjoy a free estate of £100 per annum were prohibited from wearing furs, skins, or silk, and the use of foreign cloth was allowed to the royal family alone. Act 37 Edward III. declares that the outrageous and excessive apparel of divers people against their estate and degree is the destruction and impoverishment of the land, and prescribes the apparel of the various classes into which it distributes the people; it goes no higher than knights, but there are minute regulations for the clothing of women and children. This statute, however, was repealed the next year. In France, there were sumptuary laws as old as Charlemagne, prohibiting or taxing the use of furs; but the first extensive attempt to restrict extravagance in dress was under Philip IV. By an edict of Charles VI., no one was allowed to exceed a soup and two dishes at dinner. Sumptuary laws continued to be introduced in England in the 16th, and in France as late as the 17th century. Scotland had also a similar class of statutes. The Scottish Parliament attempted to regulate the dress of the ladies, to save the purses of the 'puir gentlemen their husbands and fathers.' There was a prohibition against their

coming to kirk or market with the face muffled in a veil; and statutes were passed against superfluous banqueting, and the inordinate use of foreign spices 'brocht from the pairts beyond sea, and sauld at dear prices to monie folk that are very unabill to sustain that coaste.' Neither in England, Scotland, nor France do these laws appear to have been practically observed to any great extent: in fact, the kings of France and England contributed far more, by their love of pageantry, to excite a taste for luxury among their subjects, than by their ordinances to repress it. Mr Froude suggests that such statutes may have been regarded, at the time when they were issued, rather as authoritative declarations of what wise and good men considered right, than as laws to which obedience could be enforced. Enactments of this kind have long been considered to be opposed to the principles of political economy. Most of the English sumptuary laws were repealed by 1 James I. c. 25, but a few remained on the statute-book as late as 1856.

SU'MTER, Fort (originally spelled *Sumpter*, after General Sumpter, in whose honour it was named), an American fort of the second class, built 1845—1855, in the form of a truncated pentagon 50 feet high, on an artificial island, at the entrance of Charleston Harbour, two and a half miles distant from Forts Moultrie and Pinckney, on either side. On the secession of South Carolina, December 1860, Major Anderson, in command of the defences of the harbour, was called upon to surrender them to the state authorities. Instead of doing this, he abandoned the other forts, and occupied Fort S., mounting 52 guns, with a garrison of 70 men and 30 or 40 workmen. This was considered an act of war by the Confederates and their troops, who, under command of General Beauregard, took possession of Forts Pinckney and Moultrie, and erected additional batteries. While the surrender of the fort was under consideration, a fleet was sent from New York for its relief. On its appearance off the harbour, the attack on the fort was opened by General Beauregard, April 12, 1861, and it surrendered on the 13th. This event aroused the North, and began the war which terminated in 1865. During the siege of Charleston, this fort was battered by the heaviest artillery, until its walls were completely crushed and shattered. The flagstaff was shot away fifty times, and thousands of tons of iron projectiles were mingled with the débris of the fort; but the garrison constructed a still stronger fortress on its ruins, and held it for three years against assault and bombardment, until the operations of General Sherman compelled its evacuation, and the United States flag was again raised, April 14, 1865; an event soon followed by the evacuation of Richmond, and the surrender of all the Confederate armies.

SU'MY, a town of Russia, in the government of Kharkov, and 90 miles north-west of the town of that name, on the Psol. It contains several factories, and has an important annual fair. Pop. 3,811.

SUN, The, the great luminary upon which not only our well-being but our very existence depends, has been from the earliest ages a source of wonder and admiration, and its worship was probably the very first form of idolatry. See Sun-worship.

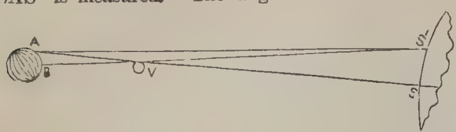
When the true system of the universe became known, one of the first labours of astronomers was to ascertain the distance and size of the sun, and these have been known for some time with tolerable precision; but until lately, the most vague and unsatisfactory theories regarding its chemical and physical constitution have continued to prevail.

Within the last few years, however, our knowledge of its chemical and physical constitution has increased with a rapidity probably unequalled in any other branch of science. This is due to the rigorous methods which in modern times are employed in every physical research, but chiefly to the fact, that the inquiries on the nature of the sun's body have been so fortunate as to gain recently two entirely new instruments of investigation of extraordinary power. These new instruments are, 1. *Spectrum analysis* (see Spectrum); and 2. *The application of Photography* (q. v.) *to record celestial phenomena.* Viewing the results which science has already obtained by means of spectrum analysis and celestial photography, and considering the shortness of the period in which these have been available, we hardly over-estimate their importance when we say that combined they will probably form a turning-point in the history of physical astronomy.

Our knowledge regarding the sun is best arranged under three heads: viz., *The general relations of the sun to our globe; the sun's chemical constitution;* and *its physical constitution.*

Relations of the Sun to the Earth, as the Source of Light and Heat.—In order to appreciate the grandeur of the scale on which solar activity is carried on, it is only necessary to know a few facts relative to the sun, which are best expressed by numbers. The *mean distance* of the sun from the earth, as recently estimated and corrected by Mr Stone from Le Verrier's determination of the solar parallax, is about 91,700,000 miles. The determination of this distance has always been considered the noblest problem in astronomy, chiefly because upon this measure depends every other measure of dimension in astronomy excepting those relating to the moon. The dimensions of the sun, and of every planet and satellite, and the distance of stars whose parallaxes are known, can none of them be determined without knowing our distance from the sun, and as the above recent determination gives the distance by nearly 3,500,000 of miles *less* than the hitherto received measure, it may be well to point out the probable cause of this discrepancy. We may here premise that the simple method of determining by direct observation the angle of Parallax (q. v.) on which the distance depends, although applicable to the moon, is impracticable in the case of the sun, owing chiefly to the circumstance that no stars can be seen in apparent contact with the sun's limb. The older determination of the sun's distance depended on observations of transits of Venus across the sun's disc in 1764 and 1769—mainly on those of the latter year. But the results almost entirely depended upon several fundamental facts and measurements, the accuracy of which, in the undeveloped state of astronomical observation during last century, could not be depended upon. Considering the wonderful accuracy which characterises modern astronomical research, it is now agreed among astronomers that this question will be best settled when another opportunity shall present itself to repeat the original investigation founded on transits of Venus. This will occur in 1874 and 1882; and it has been shewn by Mr Airy that the transit of 1882 will in every respect be particularly favourable for finally solving this problem. In proceeding to explain the method adopted for determining the sun's distance, it is assumed that the *relative* distances of the earth and the planet Venus from the sun are known, and that these are as 100 to 72. The orbits of both planets being approximately circular, when Venus is between the earth and the sun, her distance from the earth will therefore on this scale be expressed by 28. In the figure, let Venus (V) be so exactly between the sun and the earth that she can be seen upon the face

of the sun. An observer at A sees her upon the point S, and an observer at B sees her upon the point S′. The relation between S and S′ admits of accurate record, being observed in time, and converted into angular measure, and by means of this record the angle SAS′ is measured. The angle which we desire to



obtain in order to measure the sun's distance is AS′B. Now, the ratio of the measured angle SAS′ to the desired angle AS′B is sensibly the same as that of the distance of Venus from the sun to her distance from the earth, or as 72 : 28 very nearly, and thus we can calculate AS′B. It is the circumstance that we measure a large angle in order to infer from it a small one, which makes the transit of Venus the most favourable opportunity of all for obtaining an exact result. A transit of Mercury is inapplicable to the measure of the sun's distance, because the measured and required angles are here in the proportion of 4 to 6, that is, a small angle is measured to obtain a larger one, which is unfavourable to accuracy.

The other important numerical facts relative to the sun are the following: Its *diameter* is 850,100 miles, or more than 108 times the mean diameter of the earth; it is also nearly twice as great as that of the moon's orbit around the earth, so that if the earth were placed in the centre of the sun, the moon revolving round the earth would still be at a depth within the sun of more than 187,000 miles from its surface. The *volume* or bulk of the sun exceeds that of the earth 1,273,000 times, and is 600 times greater than the bulk of all planets at present known, together. The *mass* of the sun, or quantity of matter it contains as measured by weight, exceeds that of the earth 325,000 times, and is 704 times greater than the masses of all known planets put together. The *period of rotation* of the sun upon its axis, discovered by Fabricius and Galileo, and by the latter first calculated from observations of the sun-spots, and which takes place in the same direction as that of the earth, is about 25 days 8 hours. It appears, however, from the investigations of Mr. Carrington, recently published, that this period varies according to the solar latitude of the spots from which it is calculated. The *inclination* of the axis of the sun to the ecliptic is about $7\frac{1}{4}^\circ$, and the *longitude of the ascending node* is about 74° 40′ (1850).

The form or *figure of the sun* has been the subject of very recent investigations. The polar and equatorial diameters of the sun's disc as observed, have been supposed to differ, though by a very small quantity only. The observations of Maskelyne and Littrow make the polar diameter greater than the equatorial, while Carlini and Bianchi arrive at the opposite result. Observations of equal excellence, and calculations of equal accuracy, giving these opposed results, it would seem a satisfactory conclusion, borne out by other additional facts, that the figure of the disc is a true circle. Nevertheless, doubts have been lately raised as to the true figure of the sun, and it has been proposed to devise an apparatus for the purpose of examining whether the sun's disc is really circular. The Greenwich observations, made from the year 1836 to the present time, give a horizontal diameter exceeding the vertical only by 0″·1, that is, by the $\frac{1}{19230}$th part of the entire angular or apparent diameter of the sun, and although the Astronomer-royal is correct in saying that this is 'a quantity smaller than we can answer for in these or in any other methods of observation,' there remains still the fact, that the photographs of the sun do not quite agree in the amount of the value for the diameter with that given by observations.

The general laws by which the relation of our earth to the sun, as the source of light and heat, is governed, are of the most simple kind. The rays which emanate from the sun's disc into space, proceed in diverging lines, and on arriving at the earth, their intensity will be inversely proportional to the square of the sun's distance. This may be called the primary law; but the more obvious phenomena of solar heat and light are manifested to us under a secondary law, relative to the inclination of the surface at any given place and time to the direction of the rays. This law is, that the sun's intensity is less in proportion as his rays fall more obliquely; or more exactly, that it varies as the sine of his altitude. But besides this simple law, numerous causes are at work disturbing its operations, and producing the complicated phenomena which form the subject of meteorology. Captain John Ericsson, the distinguished inventor of the caloric engine, has proposed to utilize the sun's heat by means of a solar engine, which he asserts is essentially a modern steam-engine using to the fullest extent the mechanical energy of the sun's concentrated rays. His papers, descriptive of the dynamical value of the sun's heat, may be seen in the *London Engineering Journal*. See CLIMATE, EARTH, TEMPERATURE, &c.

Chemical Constitution of the Sun.—Astronomy long since weighed and measured the sun, and in our days, chemistry, aided by physics, has made an analysis of it. It tells us this: 'The solar atmosphere comprises, in the state of vapour, a great number of the substances which compose our planet; of the metals which enter into the composition of our alkalies and earths, it has *sodium*, *magnesium*, *calcium*; it also contains *iron*, *zinc*, *copper*, *nickel*, *chromium*, and *hydrogen*. On the other hand, neither gold, platinum, silver, mercury, tin, aluminium, lead, antimony, arsenic, nor silicon, at least in notable quantities, have as yet been found in it.' These affirmations are sufficiently surprising, when we consider that the body to be analysed is many millions of miles withdrawn from all chemical manipulations, tests, reagents, and the usual appliances of chemical research. For the way in which the facts have, step by step, been established, we must refer to the article SPECTRUM.

A recent extension of Prevost's theory of exchanges, due chiefly to the labours of Provostaye, Stewart, and Kirchhoff, informs us that a substance, when comparatively cold, absorbs the very same rays which it gives out when heated. Hence it was inferred by Kirchhoff, that if there were sodium or iron in a comparatively cold state in the solar atmosphere, above the source of light, these substances would produce black lines corresponding in spectral position with the bright lines which they give out when heated. It is only necessary to state, that from this law at once we have a proof, from the coincidence between dark and bright lines observed by Kirchhoff, that a large number of the absorption lines in the sun's light are caused by the presence in the sun's atmosphere, in a comparatively cold state, of the vapour of various familiar substances, and that the assertion with which we commenced this division of our subject is strictly proved.

Physical Constitution of the Sun.—What spectrum analysis is for an investigation into the chemical constitution of the sun, the new art of celestial photography is for the final determination of its physical state. Since the first discovery by Fabricius

of those remarkable phenomena on the sun called *sun-spots*, an immense variety of theories, as to the probable constitution of the solar body, has been brought forward by nearly every observer; but the fleeting and transient nature of these phenomena has often raised into theories momentary impressions, which in a great many cases have proved to be in opposition to established physical laws. Solar photography will probably best enable us to solve the mystery that still surrounds this question, not only by presenting the objects to an optical scrutiny, under circumstances more advantageous than those which attend telescopic examination, but chiefly because it enables us to keep a permanent record of passing phenomena, ready at any time for deliberate measurement and comparison, from which alone the general laws will ultimately be derived.

One of the most important discoveries in connection with sun-spots, science owes to Dr Alexander Wilson of Glasgow, who, in the year 1769, observed certain general and remarkable features of sun-spots, which enabled him to establish the significance of these phenomena for a solution of the question as to the sun's physical constitution. These features are as follows: When a spot was near the middle of the sun, it was found to consist of a dark *central* part, called the *nucleus* or *umbra*, and *around this* was a comparatively brighter envelope, called the *penumbra*, and at such a time both parts were distinctly visible. But as the spot approached one border, the penumbra on the side nearest the observer became gradually more and more foreshortened, while the penumbra on the other side grew broader and broader, and at length, as the spot was disappearing, that is, passing the edge of the limb, the near side of the penumbra, as well as the dark central part, entirely vanished, nothing remaining except the opposite penumbra. When a spot made its appearance on the other side of the border, Wilson noticed the same phenomena in an opposite order, and soon discovered that they were nearly universal. It followed from these observations at once, that every spot presents the appearance of a funnel-shaped opening in the sun's body, which by the rotation of the latter, successively presented the described appearances. These observations have been abundantly confirmed by Messrs De la Rue, Stewart, and Loewy.

An accurate and laborious investigation by Hofrath Schwabe must next be mentioned. He has shewn, as the result of nearly forty years' observations, that the number of groups of sun-spots is not the same from year to year, but has a maximum about every ten years; and General Sabine has recorded the wonderful fact, that the various epochs of maximum spot-frequency are also those of maximum disturbance of our earth's magnetism. It has been more recently shewn that they are in some way influenced by the planets Venus, Mercury, and the Earth.

It was next shewn by Carrington that sun-spots have a proper motion of their own—those near the solar equator moving faster than those near the poles.

While spots are darker than the general surface of the sun, there are also frequently observed patches brighter than the general surface. These are called *faculæ*, and they generally accompany spots, most frequently in their wake; but they are only distinctly visible near the sun's limb, and lose their specific luminosity near the centre of the sun's disc.

But there is another phenomenon connected with our luminary not less remarkable than sun-spots. This is the red flames, or *protuberances*, which surround the sun's disc on the occasion of a total eclipse. These remarkable appearances have lately been proved by Mr De la Rue to belong to the sun. Zöllner has observed the red eruptive flames or protuberances very distinctly, and compares them to cumulus clouds with occasional eruptions resembling those of volcanoes or hot springs, while flashes like electrical discharges extended across the field of his spectroscope, indicating the presence of intensely ignited bodies moving near the sun's surface. The whole photosphere of the sun appears to consist of separate luminous patches of a wonderful uniformity of size and shape, which have been denominated 'willow leaves,' from their resemblance to these in figure.

From these and the following phenomena astronomers have concluded that the sun possesses a very extensive atmosphere, colder than the source from which the light emanates. 1. In all photographic pictures of the sun the centre of the disc is brighter than the border, as if the oblique rays from the border had to pass through a greater extent of a comparatively cold absorbing atmosphere. 2. Kirchhoff's discovery leads to the same conclusion, since it implies the presence in the sun's atmosphere of a number of substances in a comparatively cold state. 3. The red flames seen during a total eclipse indicate the extension of matter around the sun to a distance of at least 72,000 miles above the photosphere; and the nature of the light given out by these red flames is that which characterizes gaseous matter in a heated state.

If a spot be hollow, as we have reason to suppose, it is only necessary to believe that there has been a descending current of this cold absorbing atmosphere to account for the want of luminosity. In like manner, on this hypothesis, a facula will be a portion of the luminous matter which has been removed high up into the atmosphere, and which thus escapes, more especially near the borders (where it shines out brightly), the absorbing influence of the atmosphere. A spot may thus be supposed to be produced by two currents—one ascending, and carrying the hot luminous matter up; the other descending, and carrying the cold atmosphere down. The hot luminous matter, being carried up into a region of greater velocity of rotation, will fall behind; and this may account for faculæ being generally in the wake of spots. On the other hand, the cold matter coming down will be carried forward; and this may account for the proper motion of spots observed by Carrington.

During the solar eclipse of August 17, 1868, in India, the observers agreed that the protuberances * are gaseous in their nature, and consist of heated hydrogen, and probably sodium and other terrestrial elements. The eclipse of 1869 was successfully observed by numerous parties skilled in the use of astronomical, spectroscopic, and photographic manipulation at Sitka, and from Sioux Falls, Dakota, to Cincinnati. During this eclipse the phenomena of the corona and the numerous bright red protuberances projected beyond the black disc of the moon attracted attention, and the latter are now believed to be mainly a mass of incandescent hydrogen, reaching to the height of 50,000 to 100,000 miles. The eclipse of 1870 was observed by American astronomers successfully in Spain, and Prof. Peirce reported the true corona to be a solar atmosphere, extending 80,000 miles above the ordinarily visible surface of the sun. This was shown by three distinct sources of proof, one of which was, the spectrum observations of Prof. Young, of Dartmouth College, N. H., which confirm Secchi's discovery of a continuous spectrum at the edge of the sun, and render tenable the theory of Kirchhoff as to the sun's constitution. The corona was shewn by the English observers in Sicily to be radially polarised, and therefore to radiate while it reflects solar heat to us. As respects the chromosphere beyond the pho-

* For a series of remarkable illustrations of solar protuberances, see plate in *Am. Journ. of Science* Vol. I. April 1871.

tosphere, it is suggested by Lockyer that it extends some 5′ or 6′ from the sun, and is built up of layers of vapour of different densities.

Until very lately, when the theory of the conservation of energy became understood, the vaguest ideas regarding the probable origin of the sun's light and heat had been entertained. We are now led to think that as the particles which formed the sun have gradually come together under the influence of gravitation, the result has been the conversion of potential energy into motion, or kinetic energy, and of the latter into heat. This idea is, we believe, also entertained generally by those who have studied the subject and are at the same time acquainted with the theory of the conservation of energy. See *The Sun*, by Amédée Guillemin, London, 1870.

SUN AND FIRE WORSHIP. All investigation tends to shew that nature-worship was the basis of all polytheistic religions, and that the chief deities of the several mythologies were originally personifications of the sun, or of particular influences of the sun. The original solar nature of Jupiter, Zeus, Odin, Baal, Amen Ra (see EGYPT), Indra, &c., can hardly be mistaken. See those heads; also SCANDINAVIAN MYTHOLOGY, PHŒNICIA; and for a full development of the subject, Max Müller's essay on *Comparative Mythology* (Oxford Essays, 1856). The actual sun, however, still continued an object of worship, more especially as in the abstract and more strictly personal gods, moral and intellectual attributes came to predominate over and obscure the physical (see HELIOS), and with the worship of the sun was more or less closely associated that of fire—his representative on earth. See PARSEES, NEED-FIRE, BELTEIN.

The most complete system of sun-worship that we have any account of is that existing in Peru when discovered by the Spaniards (1526). 'Our northern natures can hardly comprehend how the sun, and the moon, and the stars were imaged in the heart of a Peruvian, and dwelt there; how the changes in these luminaries were combined with all his feelings and his fortunes; how the dawn was hope to him; how the fierce mid-day brightness was power to him; how the declining sun was death to him; and how the new morning was a resurrection to him: nay, more, how the sun, and the moon, and the stars were his personal friends, as well as his deities; how he held communion with them, and thought that they regarded every act and word; how, in his solitude, he fondly imagined that they sympathised with him; and how, with outstretched arms, he appealed to them against their own unkindness, or against the injustice of his fellow-man.'—Helps's *Spanish Conquest of America*. The Incas, as the Peruvian monarchs were called, claimed to be children of the sun, and his representatives on earth. Their government was a despotic theocracy, of which the Inca was both high-priest and king. In Cuzco, the capital, stood a splendid temple to the sun, all the implements of which were of gold. On the west end of the interior was a representation of the sun's disc and rays in solid gold, so placed that the rising sun, shining in at the open east end, fell full upon the image, and was reflected with dazzling splendour. In the place or square of the temple, a great annual festival was held at the summer solstice. The multitude, assembled from all parts of the empire, and presided over by the Inca, awaited in breathless solemnity the first rays of their deity to strike the golden image in the temple, when the whole prostrated themselves in adoration. Sacrifices, similar to those of the Jews, were offered on the occasion, and bread and wine were partaken of in a manner strikingly resembling the Christian communion.

'It must not be supposed that the sun alone absorbed the devotion of the Peruvians. There was little in nature that they did not contrive to make a deity of. The Moon, as the spouse of the Sun, the planet Venus as his page, the Pleiades, and the remarkable constellation of the Southern Cross, were minor deities. The rainbow and lightning were also worshipped as servants of the Sun; and fire, air, earth, and water were not without adoration.'

S'UNAH'S'EPHA is, in the ancient legends of India, the son of a poor Brahman, Ajîgarta, who was sold by his father for 100 cows to *Haris'chandra* (q. v.), and offered by the latter as a victim to Varun'a, instead of his own son Rohita, whom he had pledged himself to sacrifice to this god. The legend relates that when S. was bound to the sacrificial post by his own father—for no priest could be found to perform the ceremony—and when his father came whetting his sword to kill him—for neither was any priest to be found who would perform such a sacrifice—S. prayed in succession to the gods Prajâpati, Agni, Savitr'i, Varun'a, again to Agni, then to the Vis'we-Devâh', Indra, the As'wins, and the Dawn; and while he praised the Dawn with three verses, at the delivery of each verse his fetters became looser, and when the last verse was said, he became free again. He left afterwards the family of his parents, and was adopted by *Vis'wâmitra*, under the name of S'unah's'epha Devarâta (the God-given). The *Aitareya Brâhman'a* (see VEDA), where this legend is related, also ascribes to him the first performance of some Vedic ceremony.

SU'NART, LOCH, an inlet of the sea in the extreme west of Argyleshire, Scotland, having the districts of Ardnamurchan and Sunart on the N., and that of Morven on the S.; length, inland from the Sound of Mull, 19 miles; breadth varies from 3 miles to 3 furlongs. At its head stands the village of Strontian.

SUNBIRDS (*Cinnyridæ*), a family of birds of the order *Insessores*, and tribe *Tenuirostres*, which may be regarded as a connecting link between the

Sunbird (*Nectarinia phœnicura*).

Creepers and the Humming-birds, and as occupying nearly the same place in the tropical parts of the Old World which belongs to the humming-birds in America. They are all of small size, although none are so small as the smallest humming-birds; they rival humming-birds in brilliancy of plumage, and

like them they feed on the juices of flowers, which they suck by their long bill; they do not, however, flutter on the wing when feeding, like humming-birds, but perch on or beside the flower. The species are very numerous, and are natives of the southern parts of Asia, the Eastern Archipelago, and Africa. The resplendent metallic plumage belongs only to the male, and only to the breeding season.

SU'NDA ISLANDS, that great chain of islands belonging to Malaysia, running east, commencing with Sumatra (q. v.), and ending with Timor (q. v.), and separating the Java Sea from the Indian Ocean. Sunda Strait is a passage, from 70 to 90 miles in breadth, between Sumatra and Java.

SU'NDAY. See SABBATH; LORD'S DAY; PUBLIC-HOUSES.

SUNDAY SCHOOLS. The origin of Sunday schools is popularly ascribed to Robert Raikes, of Gloucester, in 1781. His claims may, however, be fairly contested by Ludwig Hecker, of Ephrata, Pennsylvania, who, about 1739, commenced 'Sabbath schools' for the poorer classes around him. Raikes, seeing a group of children, miserably ragged, at play, was informed that 'on Sunday the street was filled with a multitude of wretches, who, having no employment on that day, spent their time in noise and riot, playing at chuck, and cursing and swearing.' To check this deplorable profanation of the Lord's Day, he engaged four women, who kept dame schools, to instruct as many children as he should send them on the Sunday, in reading and the church catechism, for which they were to receive one shilling each. In a short period, a visible improvement was effected both in the manners and morals of the children, who came in considerable numbers; they attended church with their mistresses, and a great many learned to read and say their catechism. Such was the origin of the Sunday schools. This excellent scheme was noticed in the Gloucester newspaper in 1783; but a letter of Mr Raikes, from which the above account is taken, published in the *Gentleman's Magazine* in 1784, first drew general attention to it. Numerous schools, formed on the same model, sprang up in all the principal towns; and a society, under high patronage, was formed in London in 1785 for the establishment and support of Sunday schools throughout the kingdom, which in fourteen years expended £4000 in payment of teachers. Her Majesty, Queen Charlotte, admitted Mr Raikes to an audience, and expressed her high approbation of his plan. This was the first stage of the Sunday school. The great impediment to its prosperity was the expense of hiring so many teachers. Even in Gloucester, the birthplace of the Sunday schools, after Mr Raikes's death in 1811, all the Sunday schools were closed for a time owing to want of funds. Whoever first conceived the idea of gratuitous instruction, has nearly as great merit as Mr Raikes himself; but probably it was suggested by necessity to many minds in different places at the same time. It was the means of starting Sunday schools on a new career of success, and the idea spread so rapidly, that, by the year 1800, the teaching was almost universally gratuitous. A higher class of teachers offered their services; the schools ceased to be filled by the very poorest alone; handsome buildings were erected in connection with the different churches and chapels, or by general subscription, and that system was organised which has covered the land with schools. The secular teaching, which in certain instances included writing and arithmetic, was not of a very high order; but it placed the key of knowledge in the hands of multitudes who would otherwise have been unable to read and the religious instruction with which it was combined has moulded the character of some of the best men in England. In 1803, the Sunday School Union was formed, which, by its numerous publications, its travelling agents, and its connection with branch societies in every part of the kingdom, has exercised great influence on the Sunday school cause. The Institute of the Church of England, which operates in a similar manner, is of later date. Within the last few years, the Sunday school has entered upon a third stage of its history. The improvement and multiplication of week-day schools obviate the necessity for teaching reading in Sunday schools, so that they are gradually becoming restricted to religious instruction. This may for a time affect their popularity, but as the teachers are earnest men, are cultivating the art of teaching with considerable success, and as Sunday schools have prospered in Scotland, where religious teaching alone has prevailed, there is no reason to fear their stability.

The Sunday school found its way into Scotland as early as the year 1782; but it was not till 1786, when the Society for promoting Religious Knowledge among the Poor was formed, that it was publicly recognised; nor till 1797, when the Gratis Sunday School Society was originated, that schools became general. At first, they met with considerable opposition from portions of the ecclesiastical courts, but they are now supported by all the churches. Sunday School Unions exist in Edinburgh, Glasgow, and most of the large towns. The names of Dr Chalmers, James Gall, the author of the *Lesson System*, and David Stowe, the author of the *Training System*, deserve mention in connection with the progress of Sunday schools in Scotland. In Ireland, Sunday schools had been partially anticipated in County Down in 1770; but it was not till 1785 that the system pursued by Mr Raikes was adopted, since which, its history has been analogous to that of England. The Sunday School Society for Ireland was established in 1809. Sunday schools were introduced into New York in 1816, through the exertions of some benevolent ladies, from which they have spread themselves through the United States. They are now to be found wherever the English tongue is spoken. They thrive vigorously in the Protestant churches of France; and more recently have been planted in parts of Germany and Italy. The Roman Catholics, in this country at least, have numerous Sunday schools. Of the numbers of teachers and scholars who are weekly assembled in the schools throughout the world, no estimate can be formed; but it is stated on good authority that there are in the United Kingdom about 300,000 teachers and 3,000,000 scholars.

SU'NDERBUNDS, a tract of British India, presidency of Bengal, consists of a number of low islands, forming the delta of the Ganges. The tract extends east from the mouth of the Hoogly to the island Rabanabad, is 158 miles long, 75 miles broad, has an area of 6500 sq. m., and an inconsiderable population. The islands are separated from each other by narrow channels, through which the waters of the Ganges force their way to the sea. The chief channels (14 in number) are navigable for the largest craft used in inland navigation. In such of the islands as have not been cleared, luxuriant woods abound, and afford lairs for the tiger, wild boar, and other ferocious animals. Government have commenced vigorous operations for the clearing of the islands, and grants of land are offered to settlers at a nominal rate. The climate, though improving, and capable of further improvement, is, as might be expected, very unhealthy. Rice, sugar, and indigo are produced in the cleared districts.

Large quantities of fish, obtained in the waters of the S., are sent to Calcutta. Large and fierce alligators abound in the channels.

SUNDERLAND, a thriving municipal and parliamentary borough and seaport, in the county of Durham, 13 miles north-east of the city of that name, at the mouth of the Wear. The town may be said to be co-extensive with the parliamentary borough, and to include the suburbs of Bishop-Wearmouth on the south bank, and Monk-Wearmouth and Southwick on the north bank of the river, connected with S. proper by an iron bridge of one arch, 236 feet long, and nearly 100 feet above the river at low water. The bridge over the Wear was erected in 1796, but was repaired and widened in 1858 by Robert Stephenson (q. v.), at the cost of about £40,000. On both sides of the river there are extensive wet docks, much of the area of which has been reclaimed from the sea. The harbour, which is defended by batteries, is formed by two great piers, one 650 yards and the other 590 yards in length; and the port is resorted to by vessels of the largest tonnage, from all commercial countries. In 1872, 2456 vessels, of 698,224 tons, entered, and 2986, of 868,329 tons, cleared the port. In the same year 3,482,860 tons of coal were exported. After Newcastle, Sunderland is probably the largest coal-shipping port in the world. Ship-building is one of the principal branches of industry. Glass, earthenware, ropes, and chains, anchors, and other iron-wares, are very extensively manufactured. Coals, lime, grindstones obtained from quarries in the neighbourhood, together with the manufactures, are exported. The public park of S., about 70 acres in extent, is adorned with a bronze statue of General Sir Henry Havelock, a native of the town, and commands a fine view of the sea. The village of Roker, a mile from the town, is much resorted to for sea-bathing. Fishing is carried on to a considerable extent. Pop. of parliamentary borough, which returns two members to the House of Commons (1851), 67,394; (1881), 124,960; of municipal borough (1881), 116,262.

SUNDERLAND, ROBERT SPENCER, second Earl, was the only son of HENRY, first earl, who had been raised to the peerage in 1643, for his exertions in the royal cause. He was born in 1642, and after serving as ambassador to several courts, became in 1679 Secretary of State. He had by this time manifested remarkable talent. Bishop Burnet says of him: 'He had a superior genius to all the men of business that I have yet known.' At first, he united with Essex and Halifax in opposing Shaftesbury, who wished to set Monmouth on the throne, and favoured the exclusion of the Duke of York. He encouraged the king to persevere in the degrading French alliance, and, with the Duchess of Portsmouth, to whom he attached himself, negotiated a treaty by which, in consideration of an annual pension from the French king, Charles was to agree to assemble no parliament for three years. Before the end of the year, he had shaken off Essex and Halifax; and a new triumvirate, consisting of himself, Lord Hyde, and Godolphin, succeeded to the confidence of Charles II. The treaty with France was broken off, and S., who was now afraid of the Whigs, engaged the king in a more popular alliance with Spain. After the dissolution of the last of the exclusion parliaments, he lost his office; but the duchess remained faithful to him in disgrace; and by her influence, and that of Lord Rochester, he was, in 1682, says Bishop Burnet, 'upon great submission made to the Duke [of York], again restored to be Secretary.' He remained in office until the accession of James II., when his influence in the ministry became greater than ever. He who had so often saved himself in the former reign by the influence of the Duchess of Portsmouth, now secured himself another patroness in the king's second wife, the Princess of Modena. Although there is reason to believe he gave some encouragement to Monmouth in his rebellion, he managed, with consummate art, to obtain the entire confidence of James, and in 1685 became prime minister. He was intrusted with a knowledge of the king's intention to establish the Roman Catholic religion as the national church, and was indeed the only minister in whom the king confided. In 1687, he privately conformed to the Roman Catholic Church, and afterwards openly professed his conversion. His influence was so great, that James would grant no favour until he had asked the question: 'Have they spoken to Sunderland?' and when told that this nobleman got all the money of the court, he would reply: 'He deserves it.' Yet we find him about this time in correspondence with the Prince of Orange, afterwards William III. The Princess Anne described S. as 'the subtillest workingest villain that is on the face of the earth.' Burnet says he entered into a particular confidence with the Prince of Orange, which he managed by his uncle, Mr Sidney, who was sent envoy to Holland. With profligate but masterly dexterity, he contrived to deceive both his master and Barillon, and to keep them in ignorance of the events that were passing in Holland. When the Prince arrived in England, S. and his wife went to Amsterdam, whence he wrote to the new monarch, claiming his favour and protection on the ground that he had all along been in his interest. In 1691, he was allowed to return to England, and to kiss the king's hand. In 1695, William III. spent a week at S.'s house at Althorpe. It was imputed to him that he had changed his religion, in the late reign, in order the more effectually to ruin King James; and it was generally believed that he had rendered King William, when Prince of Orange, some signal services, which no one else could have done. This belief gained credit from the favour shewn him by William. He was made Lord Chamberlain, and as such took his seat at the head of the council table. After directing affairs as the acknowledged head of the government, he resigned office in 1697, and retired to private life. He spent the rest of his days at Althorpe, where he died in 1702. He never shone as a public speaker. He had, however, unusual abilities for business, and a rare skill in the art of insinuation. He possessed exquisite courtly talent, extraordinary versatility, and a flexibility of principle too common in his day, but carried by him to the most reprehensible lengths. By his wife, Anne, daughter of the second Earl of Bristol, he left CHARLES SPENCER, third earl, who was born in 1674. He was described by Evelyn as a youth of extraordinary hopes, very learned for his age, and ingenious. He was for some time Secretary of State in the reign of Queen Anne, and under George I. rose to be all-powerful; but in 1721, being accused of receiving £50,000 worth of the fictitious stock distributed by the directors of the South Sea Scheme (q. v.), in order to bribe the government, he was acquitted only by an inconsiderable majority and that from party considerations, and the indignation of the public made him resign his office. He died in 1722, not without suspicion of having intrigued, after his fall, for the restoration of the Tories, if not for the return of the Pretender. S. was a type of the political morality, or rather immorality, of a disgraceful age, when the greatest statesmen made no scruple of sacrificing either their own party, or the interests and dignity of the nation to personal

ambition. His title descended to CHARLES, his second son, who succeeding, 1733, to the honours of his illustrious grandfather, John Churchill, the earldom of Sunderland became absorbed in the dukedom of Marlborough. His third son, JOHN, was ancestor of the Earls Spencer.

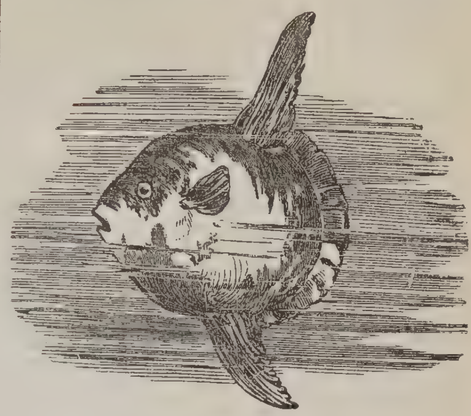
SU'NDEW (*Drosera*), a beautiful and interesting genus of plants of the natural order *Droseraceæ*, several species of which are natives of the U. States, found in bogs and moist healthy ground. The most common is the ROUND-LEAVED S. (*D. rotundifolia*), which is found in almost all places suitable to

Sundew (*Drosera rotundifolia*).

the plant. The leaves all spring from the root, and spread out in a rosette, from the centre of which springs the flower-stem or scape, with a raceme of flowers all on one side. The leaves of this and the other species are fringed and beset in all parts with hairs, which bear at their extremity viscid glands, and the irritation of these glands causes them to contract and fold up, so that insects are imprisoned by them. The whole plant is acrid, curdles milk, and has a reputation for removing corns, bunions, and warts. An agreeable liqueur, called *Rossoli* (*Ros Solis*) is made by infusing four handfuls of the plant in two quarts of brandy, and adding a pound and a half of finely powdered sugar, a pint and a half of milk, and an ounce of powdered cinnamon, straining through a cloth, and adding two grains of musk, and half an ounce of sugar-candy.

SUN-DIAL. See DIAL.

SU'NFISH (*Orthagoriscus*), a genus of fishes of the order *Plectognathi* (see DIODON), having the body compressed, and not capable of inflation, as in the other *Diodontidæ;* abruptly terminating in a very short tail; the dorsal and anal fins long and pointed, united to the short tail-fin; each jaw furnished with a cutting edge of bone instead of teeth. The species chiefly inhabit the seas of warm climates, but two are occasionally seen on the coasts of Britain. The SHORT S. (*O. mola*), when young, is almost perfectly round, but becomes rather more elongated when full grown. The name S. is variously regarded as derived from the form of the fish, and from its habit of floating at the surface of the water, in fine weather, as if to enjoy the sunshine. It attains a large size, being sometimes five or six feet in length, and is harpooned by sailors. Its flesh is white and well flavoured, somewhat resembling that of the skate. The liver yields a large quantity of oil, which is in repute among sailors as an external application for the cure of sprains, rheumatism, &c. The OBLONG S. (*O. oblongus*), of which specimens have also been taken



Sunfish (*Orthagoriscus mola*).

on the British coasts, but more rarely, is of a longer form. It also attains a large size. The Sunfishes feed upon sea-weeds.

SU'NFLOWER (*Helianthus*), a genus of plants of the natural order *Compositæ*, suborder *Corymbiferæ*, having large flowers; the florets of the ray strap-shaped, without stamens or pistils, yellow or orange; the florets of the disc tubular, perfect, yellow or purplish brown; the flowers solitary or in corymbs, with an involucre of numerous leaves; the fruit compressed, with a pappus of two or more deciduous scales. The species are numerous, all natives of America; large herbaceous plants, with opposite or sometimes alternate undivided leaves. The ANNUAL S. (*H. annuus*), common in our flower-gardens, is a native of tropical America, where it

Sunflower (***Helianthus annuus***).

sometimes attains a height of twenty feet. The stem is thick and rough; the flowers solitary, and from one foot to two feet in diameter, nodding; the leaves heart-shaped-ovate. This plant is now cultivated in almost all parts of the world, and in the south of Europe is sometimes a field-crop; the seeds being valued as food for cattle and poultry, and on account of the oil which they yield, which

is little inferior to olive oil. An acre of good land produces about fifty bushels of seed, each bushel yielding a gallon of oil. The seeds are also used like almonds for making demulcent and soothing emulsions; and in some parts of Europe, a bouilli is made of them, which is used as food for infants. The American Indians make bread of them. The flowers abound in honey, and are much frequented by bees. The leaves are good fodder for cattle. The stems are used for fuel, and yield much potash. —The Jerusalem Artichoke (q. v.) belongs to this genus.

SUNN (*Crotalaria* [q. v.] *juncea*), a leguminous plant, native of India, which has been in general cultivation there from time immemorial, for the fibre of its bark. It has a strong general resemblance to Spanish Broom. It is, however, an annual plant. The plant is cultivated not only for its fibre, but as food for milch-cows. The seed is generally sown in April or May, and in August it is pulled, or cut close to the ground —when grown for its fibre—laid in long rows till the leaves begin to rot and separate from the stalks, and steeped in water for a few days, till the bark separates freely. The fibre is not so strong as hemp; but good cables, canvas, and cloth are made of it. It is now imported in considerable quantity into Britain. It is known by various names. *Taag* is one of its Indian names, and it is sometimes called *Brown Hemp*, *Bengal Hemp*, &c. The confusion of names makes it difficult to ascertain the quantity imported.

SU'NNA (Arab. custom, legal usage), originally denotes among Muslims the sayings and the example of Mohammed and his community, provided they are in accordance with the Koran, the meaning of which, however, is itself explained by the Sunna. The term is therefore (though incorrectly) used for the collections of moral and legal traditions traced to the Prophet, which supplement the Koran, somewhat like the Mishna (q. v.), which supplements the Laws of the Pentateuch. The Sunna not only comprises religious doctrines and practice, but also civil and criminal laws, and the usages of common life: the way to eat and to drink, and to dress, and the like. This tradition is first heard of during the civil wars among the adherents of the new faith, about half a century after the Flight. The single traditions, as we now possess them, rarely exceed six lines. The diction is carefully wrought, and the form is that of a dialogue. For the credibility and canonicity of a tradition, it was originally necessary that it should have been *heard* by one truthful witness; but this law was much relaxed in after-time. At the end of the 3d c. (H.), a countless number of individual collections (Mosnad), mostly of an apocryphal character, had been produced by different theologians, but the first who sifted them critically, and without regard to any special theological system, was Bochary (d. 256 H.). His collection contains 7275 single traditions, 4000 of which, however, occur twice in the work. Moslim, his pupil, supplemented Bochary with another collection, containing 12,000, again including 4000 repetitions. Besides these, there are four more 'canonical' collections; by Abû Dawûd (d. 275 H.), Tirmidzy (d. 279), Nasây (d. 303), and Mâga (d. 273). The Sunna, as we have it in these collections, contains, broadly speaking, more truth than it is generally supposed to contain, and, critically used, is, besides the Koran, the most authentic source of Islam. A selection from the different collections (both canonical and otherwise), called *Mishcat Al Masabih*, has been translated into English by Captain Matthews (Calcutta, 1809). Fragments from Bochary are found in a German translation, by Hammer, in the *Fundgruben des Orients*.

SU'NNITES, traditionists or believers in the Sunna (q. v.); the name of the 'orthodox' Muslims, as opposed to the Shiites (q. v.). They are subdivided into four principal sects, who, though at issue on different minor points, yet are acknowledged, by each other, to belong to the Faithful, and to be capable of salvation, and they each have a special oratory at Mecca. The first of these sects are the Hanefites, founded by Abu Hanifa, who died 150 years after the Hedjrah. They are emphatically called 'the followers of reason,' whilst the other three are guided exclusively by tradition. They allow reason to have a principal share in their decisions on legal and other points. To this sect belong chiefly the Turks and Tartars. The second sect are the Malekites, founded by Malek Ibn Ans, who died about 180 H. at Medina. As one of the chief proofs of his real piety and humility, it is recorded that when asked for his decision on 48 questions, he would only decide on 16, freely confessing his ignorance about the others. In Barbary and other parts of Africa, the greatest part of his adherents are found. Mohammed Al Shâfeï, born in Palestine, 150 H., but educated in Mecca, is the founder of the third sect, the Shâfæites. He was a great enemy of the scholastic divines, and seems altogether to have been of an original cast of mind. He never swore by God, and always took time to consider whether he should at all answer any given question or hold his peace. The most characteristic saying recorded of him is: 'Whosoever pretends to love both the work and the Creator at the same time, is a liar.' He is accounted of such importance, that according to his contemporaries, 'he was as the sun to the world, and as health to the body;' and all the relations of the traditions of Mohammed were said to have been asleep until he came and woke them. He appears to have been the first who reduced Muslim jurisprudence into a method, and thus made it, from a number of vague sayings, a science. His followers are now chiefly found in Arabia and Persia. Ahmed Ibn Hanbal founded the fourth sect, the Hanbalites. He was born 164 H., and was a most intimate friend of Shâfeï. His knowledge of the traditions (of which he could repeat no less than a million) was no less famed than was his piety. He taught that the Koran was not created, but everlastingly subsisted in the essence of God; a doctrine for which he was severely punished by the Calif Al-Motasem. On the day of his death, no less than 20,000 unbelievers (Jews, Christians, and Magians) are said to have embraced the Mohammedan faith. Once very numerous, the Hanbalites now are but very rarely met with out of Arabia. On the differences between the S. and Shiites, see SHIITES.

SUN-STROKE (otherwise called *Heat Apoplexy*, *Heat Asphyxia*, *Coup de Soleil*, *Erythismus tropicus*, and *Insolatio*, the name by which it is officially known in the returns of the Registrar-general) is a very fatal affection of the nervous system, which seldom occurs in Great Britain, except in extremely hot summers, but is very common in India and other tropical countries. Our knowledge of the nature of this remarkable disease is almost entirely based upon the accounts which have been given of it by Indian medical officers. It is from their reports that the most satisfactory history of this disease at present published—that, namely, of Dr Aitken in his *Science and Practice of Medicine*, 3d ed., 1864—is mainly drawn up. From the accounts given by these observers, it is clear that the symptoms of the disease are liable to be greatly

modified in different cases. Mr Russell, when in charge of the 68th Regiment in May 1834, shortly after its arrival at Madras, with the men in robust health, has given the following account of this disease. 'The funeral of a general officer being about to take place, the men were marched out *at an early hour in the afternoon, buttoned up in red coats and military stocks, at a season, too, when the hot land winds had just set in*, rendering the atmosphere dry and suffocating even under the shelter of a roof, and when the sun's rays were excessively powerful. After having proceeded two or three miles, several men fell down senseless. As many as eight or nine were brought into hospital that evening, and many more on the following day. Three men died--one on the spot, and two within a few hours. The symptoms observed (and they were alike in the three cases) were, first, excessive thirst, and a sense of faintness; then difficulty of breathing, stertor, coma, lividity of the face, and in one whom Mr Russell examined, contraction of the pupil. The remainder of the cases (in which the attack was slighter, and the power of reaction perhaps greater) rallied; and the attack in them ran on into either an ephemeral or a more continued form of fever.' Aitken, *op. cit.* One of the earliest symptoms, noticed by several observers, is the skin becoming rough and scaly, and the perspiration ceasing; the heat of the surface becomes at the same time much increased; the bowels become obstinately constipated. The actual attack, in the various cases described by the Indian surgeons and physicians, came on generally when the men were in their tents, sometimes during the day, but in several cases during the night. The patient had been generally lying down, often seemingly asleep, when the attention of his comrades would be directed to his hurried and heavy breathing, and on attempting to rouse him, he was found to be insensible. The mortality from sun-stroke is about 50 per cent. In the cases that terminate favourably, a gradual remission of the symptoms takes place; and when the skin becomes cool and moist, and sleep has been procured (phenomena which usually occur within 36 hours of the attack), the patient may be regarded as out of danger.

The predisposing causes of sun-stroke are (1), an unusually elevated degree of temperature, accompanied by great dryness of the air; (2) The electrical condition of the atmosphere that precedes a thunderstorm; (3) A contaminated atmosphere from overcrowding; (4) All debilitating causes, such as prolonged marches, previous disease, intemperate habits, &c. Death sometimes occurs so suddenly that there is little opportunity for treatment, but the general indications in these cases are—the cold douche, from a height of three or four feet, keeping the surface wet and exposed to a current of air, the exclusion of light as far as possible, and the free employment of stimulants. In less rapidly fatal cases, the outer clothing should be removed, and the douche applied, as before, over the head and along the spine. Relaxation of the pupil is the first favourable sign. If the pulse flags, the douche must be replaced by the mere application of cold to the head. The hair must be cut as short as possible, and the nape of the neck blistered as speedily as possible. If insensibility recurs after an interval of ten or twelve hours, a blister should be applied to the crown of the head. The extremities and chest should be stimulated with mustard poultices. Immediately after the employment of the douche, a strong purgative injection should be thrown up the lower bowel, by means of a long stomach-pump tube (as, for example, a mixture of an ounce and a half each of castor oil and oil of turpentine, and two drachms of tincture of asafœtida in about half a pint of barley-water). Under no circumstances, should there be any abstraction of blood. The preventive measures are of more importance than the treatment; but this is a subject into which we have not space to enter. The advice of the regimental surgeon is too often disregarded by the commanding officer; and the lines which are italicised in Mr Russell's account of the cases—quoted at the beginning of this article—would seem to contain a well-devised prescription for the induction rather than the prevention of sun-stroke.

SUONADA (inland sea), an inland sea of Japan, which separates the island of Kiusiu and Sikopf from the larger one of Nipon. It is about 250 miles in length from the strait of Simonoseki to Osaca; and Sir R. Alcock estimates its greatest breadth at 50 miles. It is studded with innumerable islets and a few rocks. The scenery is picturesque. The prince of Nagato and Soulio having, contrary to treaty stipulations, closed this sea to foreign vessels and fired upon them, the English, French, and Dutch fleet destroyed the forts that barred its entrance (5th and 6th September 1864), with the loss, to the allied squadron, of 12 men killed and 60 wounded.

SUPERANNUA'TION is a retiring allowance granted under an act of 1859, 22 Vict. cap. 26, to all persons not being weekly labourers employed permanently in the civil service of the country. Before the age of 60, retirement can only take place from broken health (or ostensibly so), or from abolition of office: after 60, any person may retire. If the retirement take place before completing ten years' service, a gratuity only is allowed. After ten years, the pension is $\frac{1}{60}$th of the salary at the time of retirement for every year of service, up to $\frac{40}{60}$ths, which is the maximum allowed, except under very special circumstances, when the Treasury may grant larger pensions, never, however, exceeding the salary vacated. Professional persons appointed later in life than the usual age, may have pensions computed with a number of years, not exceeding 20, added to their actual service. On the other hand, the Treasury may, for grave demerit, diminish a pension below the scale granted in the act. A person on a pension is liable to recall to a position as good as he vacated, up to the age of 60, if in suitable health. A civil servant is defined to be one holding appointment direct from the crown, or under certificate from the Civil Service Commissioners; and his salary must be paid out of the consolidated fund or out of moneys voted by parliament. Weekly labourers are ineligible; but artificers may serve for superannuation, provided they are not paid at the full current market rates of wages at their respective stations.

Superannuation is one of the great boons of the permanent civil service, in which the officials are, as a rule, paid salaries lower than they could earn elsewhere; but to render promotion tolerably certain, retirement at 60 should be, not, as now, voluntary, but compulsory. At present, an official may at his option serve as long as he is capable of attending office; and many actually do die in harness, years after they have become useless.

SUPERCA'RGO is an important officer in a merchant vessel, charged with the control of all her commercial transactions. The cargo is under his care, and he judges as to its disposal and replacement.

SUPEREROGA'TION, WORKS OF (Lat. *supererogata*, over and above things required), a class of works which, in the Roman Catholic system, are described as not absolutely required of each individual

as conditions to his eternal salvation. Roman Catholics found this definition on the distinction between what they believe to be commanded and what they hold to be only counselled, for an example of which they appeal to the words of our Lord to the young man in Matthew xix. 21, which distinguish one class of works which are necessary in order to 'enter into life,' and a further class which must only be done if we 'would be perfect.' Roman Catholics do not profess to recognise in works of supererogation any distinctive essential quality by which they differ, whether in their physical or their moral entity, from other works, and in virtue of which, by their own nature, the individual may found upon them a personal claim to reward. For works of supererogation, as for all supernaturally good works, they hold that the assistance of God's grace is indispensably necessary; and they do not ascribe to them any merit, except that which arises from God's own free and gratuitous promise. In one word, the only distinctive characteristic of a work of supererogation lies in its not being supposed to be prescribed or commanded as absolutely necessary for the salvation of the individual, and its being done for the sake of greater perfection; and the doctrine which teaches the possibility of such works is, according to Catholics, a necessary consequence of the unequal fervour and unequal degrees of holiness which exist even in the class of the virtuous servants of God. A further consequence of this doctrine is that God may accept the superabundant works of one in atonement for the defective service of another; and hence, in the Catholic theory of Indulgences (q. v.), along with what they regard as the infinite and inexhaustible treasure of the merits of our Lord, they also regard, although in a degree infinitely inferior, the superabundant merits of the saints as forming part of that 'treasure of the church' which is applied in the form of indulgences.

SUPERFŒTA'TION, or the circumstance of two distinct conceptions occurring in the same woman at an interval of greater or less duration, so that two fœtuses of different ages—the offspring possibly of different parents—may co-exist in the uterus, is a subject of great interest both in a scientific and in a medico-legal point of view. A couple of centuries ago, there was a universal belief in not only the possibility but the comparative frequency of this occurrence. Fifty years ago, it was as universally disbelieved; and now again (owing to the investigations of various inquirers, amongst whom Dr Bonnar of Cupar deserves special mention), we are returning to the belief of our ancestors. The cases described as instances of superfœtation may be arranged in three classes; but as will be presently seen, it is only to the cases of the third class that the term superfœtation is truly applicable. The *first class* includes the numerous undisputed cases in which two mature children, bearing evidence, from their different colours, that they are the offspring of different parents, are born at the same time. In the slave states of America, it was by no means uncommon for a black woman to bear at the same time a black and a mulatto child—the former being the offspring of her black husband, and the latter of her white lover; and the converse has occasionally occurred—a white woman at the same time bearing a white and a mulatto child. There is no difficulty in accounting for these cases, which are examples of contemporaneous conception rather than true superfœtation. The *second class* includes those cases in which a twin has been aborted, leaving its fellow undisturbed in the uterus, to be matured and born in due time, or in which twins have been produced at the same time, one of which was fully formed, while the other was small and apparently premature, from being 'blighted' or arrested in its development at an early period. Cases of these kinds are by no means rare; but there is no reason for believing that the infants were conceived at different periods. The *third class* includes the cases in which a *mature* child has been born, and an *immature* fœtus, the product of a different conception, has either been left in the womb until its period of maturation, or, if expelled along with the other, has presented no mark of wasting or of arrested development. 'In a case of genuine superfœtation,' says Dr Bonnar, 'a woman must bear two (or more) *mature* children, with an interval of weeks or months between the birth of each; or, if she part with the whole contents of the uterus at the first delivery, the difference of the ages of the fœtuses, or the mature child and the fœtus, as the case may be, must be unmistakable, and there must be the absence of all marks of blight of the latter, so as to leave no doubt that, had it remained in utero, it would have gone on to perfect maturity.' Amongst the cases of superfœtation that have been specially discussed by writers on Midwifery and Medical Jurisprudence, are the following: (1) Velpeau quotes from the *Recueil de la Société de Médecine* the case of a woman named 'Arles,' who, in 1796, gave birth to a child at the full time, and five months afterwards to another, which was also thought to be at the full time; (2) Dr Maton, an eminent London physician, communicated to the College of Physicians the case of Mrs T——, an Italian lady, who was delivered of an apparently healthy and mature male child on the 12th of November 1807, but which lived only nine days. On the 2d of February 1808, or 82 days after the birth of the first, she was delivered of a second child, which likewise had every sign of being completely formed and mature. The following case, which, as Dr Bonnar (in his *Critical Inquiry regarding Superfœtation*, Edin. 1865) observes, 'has been the principal battle-field of the advocates of superfœtation and their opponents,' and has given rise to more discussion than any other, is recorded by Dr Desgrange of Lyon. Madame Villard had a miscarriage at seven months on the 20th of May 1779. In about a month thereafter, she conceived again, and on the 20th of January 1780, she brought forth a living child. No milk appeared in her breasts, the abdomen did not seem to diminish in size, and other symptoms which normally follow delivery were absent. The two surgeons who were in attendance being naturally puzzled, called in Dr Desgrange, who declared, in opposition to their views, that there was still a child in the womb; and his opinion was confirmed by her being delivered of a living child on the 6th of July 1780, 167 days after the first birth. Dr Bonnar has collected from *The Peerage* a number of cases of probable superfœtation occurring in married life. Excluding a very few exceptional cases, he adopts Dr William Hunter's view, that 210 days, or seven calendar months, is the minimum period of uterine life at which a child should be born in order to be reared, and he assumes that no prolific intercourse can take place until at least fourteen days after the first delivery; and with these axioms, he quotes the following cases: (1) In the Hamilton (Lord Mountflorence) family, a daughter, who was born 182 days after the birth of a son who reached maturity, lived to be married, whose supposed uterine life was not more than 168 days. (2) In the Aukland family, the Honourable William Frederick Elliot, who was born 173 days after the birth of a sister (who lived 60 years), survived 28 years, although his assumed

uterine life was only 159 days. (3) Lord Cecil J. Gordon, brother to the Marquis of Huntly, has a son, Cecil-Crosbie, who was born in January 1850 (only 127 days after the birth of a previous child). This son is now alive, and his assumed period of gestation was only 113 days. 'We cannot conceive,' says Dr Bonnar, 'how these three cases can possibly be explained except by the doctrine of superfœtation;' and Dr Taylor (*Principles and Practice of Medical Jurisprudence*, p. 849) fully adopts his view. Dr Duncan believes, from anatomical investigations, that up to the third month of gestation, a second conception may follow the first; and he is of opinion that this will satisfactorily account for all the cases of superfœtation on record.

SUPE'RIOR, in Scotch Law, means one who, or whose predecessor, has made a grant of heritable property to a vassal, on condition of the latter paying an annual duty or sum of money, generally called a feu-duty. The superior is said to have the superiority, or *dominium directum*, and the vassal has the feu, or *dominium utile*. In popular language, the superior is a kind of landlord. See FEU.—In England, the word is not used, though in copyhold estates the term 'lord' corresponds to it.

SUPERIOR, LAKE, the largest body of fresh water in the world, is the highest and most western of the great lakes lying between Canada and the United States. It is situated not far from the centre of the North American continent. Its general form is nearly semi-lunar, the outer curve being towards the north. Greatest length from east to west, 355 miles; greatest breadth, 160 miles; area, about 32,000 sq. m.—fully that of Ireland. The surface of the lake is about 630 feet above the level of the sea, and its mean depth 1000 feet, so that its bottom is 400 feet below the level of the sea. Its surface has an elevation of about 22 feet above that of Lake Huron and Lake Michigan. The greater portion of this rise is at the Sault Ste. Marie, a strong rapid about a mile in length, at the commencement of the river St Mary, which transmits the waters of Lake S. to Lake Huron.

Lake S., being situated very near the watershed between Hudson's Bay and the Mississippi, receives no rivers of importance, although hundreds of small rivers pour themselves into it. The largest are the St Louis River, which falls into its western extremity at Fond du Lac, and is about 110 miles long; and the Neepigon River, on the north side, which, with the lake of the same name, has a length of about 200 miles. One of the branches of the Mississippi in Minnesota approaches to within 20 miles of the western extremity of Lake S.; and a small lake near the head of the Albany River, of which the waters flow to Hudson's Bay, is only four miles from a bay opposite the State Islands on the northern shore, forming a route with little portage, which has long been used by the Hudson's Bay Company for the conveyance of goods from Lake S. to the northern country.

The promontory, Kee-wee-naw, near the middle of the south side, projects far into the lake. The islands are not numerous, the largest being Isle Royale, 44 miles long.

The country around Lake S. is generally bold and hilly, with the exception of the peninsula lying between it and Lake Michigan; but few of the hills rise more than 1000 feet above the level of the lake, and most of them are far below this height. On the southern shore, 100 miles west of the Saulte Ste. Marie, are the Pictured Rocks, cliffs of gray and red sandstone from 100 to 200 feet high, in many places presenting fantastic forms, and marked by numerous perpendicular stripes of red and yellow, from ferruginous waters trickling down the face of the rock.

The boundary between the United States and Canada, starting from the outlet of the lake at the Saulte Ste. Marie, sweeps towards the north, so as to include in the United States even the Isle Royale, which is only 13 miles from the British coast, and strikes inland from the mouth of Pigeon or Arrow River, on the north-west shore.

The only obstacle to navigation between Lake Huron and Lake S. is the Saulte Ste. Marie, which is overcome by a canal of about a mile in length, with two locks, on the American side. This is, perhaps, the finest canal in the world. The sides and bottom are lined with stone throughout its whole length, the locks are admirably contrived and the largest ships can pass through it with ease The trade is increasing so rapidly, that a canal on the British side will also be required at no distant day.

The water of Lake S. is remarkable for its coldness, purity, and transparency, although the affluents on both sides are either turbulent, or deeply coloured by vegetable matter from swamps and forests.

A rise or fall in the level of the water, amounting to several inches in a few hours, is frequently to be observed along the shore, and has been supposed to be due to a regular tide, but is probably caused by the wind. Fresh water being more easily moved by the wind than salt water, great waves arise in Lake S. with wonderful rapidity; and even in summer, large steamers are compelled to take shelter in some bay, or under the lee of an island. Owing to the low temperature of the water, compared with that of the air, in summer, fogs are prevalent, resting on the water at night, and vanishing an hour or two after sunrise.

Lake S. never freezes over, but the bays are sealed up in winter, and a rim of ice extends to some distance all around the shore.

The rocks around the lake are very ancient, belonging principally to the Laurentian and Huronian systems of the Azoic series, overlaid in some places, especially on the south side, with patches of the Lower Silurian. The prevalent Laurentian rock is orthoclase gneiss. Among the Huronian rocks are greenstones, slates, conglomerates, quartzites, and limestones. The Lower Silurian rocks are soft sandstones. There is everywhere much evidence of glacial action.

The Huronian rocks are well stored with useful minerals. The copper and iron mines of the south side are celebrated for their extent and richness, and silver deposits of immense value have been very recently discovered on Silver Island, on the British side, although as yet they are comparatively undeveloped. The richest copper-mines are situated near Kee-wee-naw Point. The metal occurs principally native, and sometimes in single masses of great size. One was met with in 1853, which measured about 40 feet in length, and was calculated to weigh about 400 tons. Native silver is found associated with the native copper, and sometimes intimately mixed with it. Gold has been found in small specks at Namainse on the British side. Lead ore occurs in some places. The beds of hæmatite, or red iron ore, at Marquette, on the south side, are of wonderful extent. They are situated about 12 miles inland. The ore is conveyed by a railway to the harbour thence by vessels to Cleveland, on Lake Erie, and thence by rail to Pittsburgh, where it is smelted The quantity exported from Marquette in 1864 amounted to 300,000 tons.

The fisheries of Lake S. deserve notice. The delicious white-fish and the gray trout abound, as

well as other kinds of fish. The Canadian legislature passed a law in 1865 to put a stop to the wholesale destruction of them on the spawning grounds.

The shores of Lake S. are frequented by bands of the Ojibbeway tribe of aborigines. They are of very pure blood, retain in a great measure their primitive habits, and many of them are still pagans. They seem incapable of adapting themselves to the settled life of the white man.

The white population of the British shore of Lake S. consists as yet only of the fishermen and explorers who visit the region during summer, and the miners at the rich deposits of silver ore recently opened on Silver Island, near Thunder Bay. But on the American shore a number of thriving towns have sprung up, some of them containing several thousand inhabitants. Marquette is connected by a railway with Ontonagon, also with Green Bay, on Lake Michigan, and thus with Milwaukie and Chicago; and Duluth, at the western extremity, is the eastern terminus of the N. Pacific R.R. See Disturnell's *The Inland Seas*, 1871.

SUPERPHO'SPHATES. See Phosphorus.

SUPERTO'NIC, in Music, the note which, in the diatonic scale, is next above the tonic or keynote, and forms with it the interval of the second, as D in the key of C major.

SUPPLY', Commissioners of, persons appointed by the acts imposing the land-tax in Scotland, to assess, and formerly also to collect, that tax. Their principal duty now is to assess the land-tax, and apportion the valuation according to the provisions of the Valuation of Lands Act, 17 and 18 Vict. c. 91. They are entitled to name a convener, who acts as preses of the meeting, and a clerk with a reasonable salary. The qualification, as recently modified by 17 and 18 Vict. c. 91, consists in the being named as an *ex officio* Commissioner of Supply in any act of supply; or the being proprietor, or husband of a proprietor, of lands of the yearly value of £100; or the eldest son of a proprietor of lands of the yearly value of £400: and a factor of a proprietor of lands of the yearly value of £800 is empowered to act as Commissioner of Supply in his absence.

By act 17 and 18 Vict. c. 91, the Commissioners of Supply of every county, and magistrates of every burgh, must cause a valuation roll to be made up yearly, shewing the rents of all lands or heritages in the county or burgh, and the names of the proprietors and tenants; and for this purpose, they are empowered to appoint an assessor or assessors. A yearly court is to be held by the commissioners and magistrates, for hearing appeals against the determinations of the assessors, in which three Commissioners of Supply and two magistrates are to form a quorum, the preses having a casting-vote in case of equality. See Valuation, Land-tax.

SUPPLY, Committee of. The sums granted in parliament to defray the public expenditure for the current year are called *Supplies*. All bills authorising the expenditure of public money must originate in the House of Commons, and be based on resolutions moved in a Committee of Supply, which is always a committee of the whole House. The House having resolved that a supply be granted to her Majesty, resolves itself into a Committee of Supply. The various estimates are submitted to the committee, which has to consider what specific grants are to be voted; and the resolutions of the committee are reported to the House, and adopted or rejected. It belongs to another committee of the House, the 'Committee of Ways and Means,' to consider how the sums shall be raised which are voted by the Committee of Supply. See Ways and Means, Parliament.

SUPPO'RTERS, in Heraldry, figures placed on each side of an armorial shield, as it were to support it. They seem to have been, in their origin, a purely decorative invention of medieval seal-engravers, often, however, bearing allusion to the arms or descent of the bearer; but in the course of time, their use came to be regulated by authority, and they were considered indicative that the bearer was the head of a family of eminence or distinction. The most usual supporters are animals, real or fabulous; but men in armour are also frequent, and Savages (q. v.), or naked men, often represented with clubs, and wreathed about the head and middle. There are occasional but rare instances of inanimate supporters. On early seals, a single supporter is not unfrequent, and instances are particularly common of the escutcheon being placed on the breast of an eagle displayed. The common rule, however, has been to have a supporter on each side of the shield. The dexter supporter is very often repeated on the sinister side, but the two supporters are in many cases different: when the bearer represents two different families, it is not unusual for a supporter to be adopted from the achievement of each.

In England, the privilege of bearing supporters as now defined belongs to the sovereign and princes of the blood, peers and peeresses, and the heads of a very few families not of the peerage, whose right is based on an ancient patent, or very early usage. No right is recognised by the College of Arms as

Arms of Duke of Argyll.

belonging to the sons of peers bearing courtesy titles. Knights of the Garter and Knights Grand Cross of the Bath are dignified with supporters, which, however, are not hereditary. Supporters have also been assigned to the principal mercantile companies of London. In Scotland, the use of supporters is somewhat less restricted. The distinction was much less wide than in England between the greater and lesser barons (see Minor Barons), and the right to supporters was considered to belong to the latter, so long as the baronial statute conferred a right to sit in parliament. The act of 1587, which finally excluded the lesser barons from the Scottish parliament, and established a systematic parliamentary representation, was not held to interfere with this armorial privilege, and it is yet the practice of the Lord Lyon to grant or confirm supporters to the representatives of all minor barons who had full baronial rights prior to that date. A limited number of heads of important families, including the chiefs of the larger Highland clans, apart from considerations of barony, participate in the right to supporters. Lyon is also considered to have it in his power to confer them *ex gratiâ*, a prerogative which is but sparingly exercised, one of the instances of such departure from strict rule having been in favour of Sir Walter Scott. Nova Scotia baronets as such have no right to supporters, though many

of them bear them in respect of the baronial qualification.

The lion and unicorn, familiar in the royal arms of the United Kingdom, were adopted, the former from the achievement of England, the latter from that of Scotland prior to the union of the crowns.

In the more modern heraldry, supporters generally stand either on an escrol, containing the motto, or, more properly, on a carved panel of no definite form, which in Scotland is known by the name of a *compartment*.

SUPPURA'TION is a morbid process which gives rise to the formation of Pus (q. v.), which, as is well known, is one of the commonest products of inflammation. There are two doctrines as to the origin of pus. The opinion universally adopted till very recently was, that it was formed from an excessive exudation of the fluid portions of the blood through the walls of the capillaries; in which exudation, under certain conditions, pus-cells were developed. This view is now rejected for the doctrine of Virchow, the eminent professor of pathology at Berlin, who maintains that pus-cells are generated from the corpuscles of areolar tissue, which he supposes to permeate nearly every portion of the body. Pus, according to Virchow, is a young tissue in which, amidst the rapid development of cells, all solid intercellular substance is gradually dissolved. A single cell of areolar or connective tissue may, in an extremely short space of time, produce some dozen of pus-cells; but the result is of no service to the body, suppuration being, to use his own words, 'a pure process of luxuriation, by means of which superfluous parts are produced, which do not acquire that degree of consolidation or permanent connection with one another, and with the neighbouring parts, which is necessary for the existence of the body.' There are two different modes of pus-formation, according as the pus proceeds from Epithelium (q. v.) or from connective tissue (see CELLULAR TISSUE). When pus is formed from epithelium, it is produced without any considerable loss of substance, and without ulceration; but when it is formed from connective tissue, ulceration must always exist. The mucous membranes vary in their power of forming pus. A mucous membrane, according to Virchow, is the more qualified to produce pus without ulceration the more completely its epithelium is stratified, those with a single layer of epithelium being less adapted for the production of pus. Thus the intestinal mucous membrane scarcely ever produces pus without ulceration; while other mucous membranes, containing several strata of cells, are capable of secreting enormous quantities of this fluid without the slightest ulceration (as, for example, the urethral mucous membrane in gonorrhœa).

The above cases of suppuration occur on free or exposed surfaces, and are unaccompanied with loss of tissue. Deep-seated pus-formation takes place only in connective tissue. The first stage of formation consists in an enlargement of the normal cells, and a division and excessive and rapid multiplication of their nuclei. This is soon followed by division of the cells themselves, and their conversion into true pus-cells. If this process takes place beneath a surface which does not participate in the morbid change, or which is capable of resisting it for a time, an *abscess* is formed; whereas, when pus-cells are poured forth from an exposed surface, we have an *ulcer*.

Although suppuration is a morbid process, it often accompanies processes of a beneficial tendency (such as granulation), and frequently takes the place of other far more morbid processes. It further affords a mechanical means of removing foreign bodies, such as thorn, splinters of glass, &c., from soft parts into which they may have been driven; and it is possible (as some pathologists believe) that the formation of abscesses may sometimes serve to eliminate morbid matters from the system.

SUPRALAPSA'RIAN (Lat. *supra*, before, *lapsus*, the Fall), the name given to the school of divines which maintains that God's absolute decree of election and reprobation is antecedent to His foresight of the fall of Adam, and irrespective of it. See SUBLAPSARIAN.

SUPRA-RE'NAL CAPSULES AND THEIR DISEASES. The supra-renal capsules are two small, flattened, glandular bodies of a yellowish colour, situated, as their name implies, immediately in front of the upper end of each kidney. In weight they vary from one to two drachms. They belong to the class of ductless glands, and on making a perpendicular section, each gland is seen (like the kidney) to consist of cortical and medullary substance. The blood-vessels and nerves of the glands are exceedingly numerous. Of late years, much attention has been drawn to the diseases of these organs from the observation of the late Dr Addison (of Guy's Hospital), that such cases are frequently associated with the deposition of pigment in the skin, causing it to assume a deep bronze colour. The following definition of *Addison's Disease*, or *Supra-renal Melasma*, or *Bronzed Skin Disease*, embracing all the most important points in its natural history, is given by Dr Aitken: 'A morbid state, which establishes itself with extreme insidiousness, whose characteristic features are anæmia, general languor and debility, and extreme prostration, expressed by loss of muscular power, weakness of pulse, remarkable feebleness of the heart's action, breathlessness upon slight exertion, dimness of sight, functional weakness and irritability of the stomach, and a peculiar uniform discoloration of the skin, which becomes of a brownish olive-green hue, like that of a mulatto, occurring in connection with a certain diseased condition of the supra-renal capsules. The progress of the disease is very slow, extending on an average over one year and a half, but may be prolonged over four or five. The tendency to death is by asthenia, the heart becoming utterly powerless, as if its natural stimulus—the blood—had ceased to act.'—*The Science and Practice of Medicine* (3d. ed. vol. ii. p. 72). The numerous cases recorded by different physicians of all countries since Dr Addison's original observations were made, shew that the connection between *bronzing* of the skin and various morbid states of the supra-renal capsules is a fact beyond all dispute; but the exact relationship and pathological significance of the morbid states thus connected are still open questions. The special morbid changes in the capsules necessary for the production of the symptoms which constitute the disease, are first the deposition of a translucent, softish substance; the degeneration of this to a yellowish-white opaque matter; and afterwards a softening into an abscess, or drying up into a chalky mass. In the way of treatment, nothing can be done but to attempt to improve the general health by nourishing food, tonics, &c. The literature of this very singular disorder is mainly to be found in various memoirs in the *Guy's Hospital Reports*.

SUPRE'MACY, ROYAL. The term supremacy is, in politics, chiefly used with regard to authority in matters ecclesiastical. From the time of Pope Gelasius (494 A.D.) to the Reformation, the pope exercised a very extensive authority, judicial, legislative, and executive, over all the churches of Western Europe, somewhat undefined in its limits,

varying in different countries and at different periods; which continues to be more or less recognised in all countries whose inhabitants are in communion with the Church of Rome. At the English Reformation, the papal supremacy was abolished, and act 26 Henry VIII. c. 1, declared the king and his successors to be the 'only supreme head on earth of the Church of England.' A curious document was at the same time drawn up by the government, in which, to avoid misconception, it was explained that the recognition of this headship of the church implies only that the king should have such power as of right appertaineth to a king by the law of God, and that he should not take any spiritual power from spiritual ministers, or pretend to 'take any power from the successors of the apostles that was given them by God.' In 1535, the same year in which this act was passed, John Fisher, bishop of Rochester, Sir Thomas More, and others, were beheaded for denying the king's supremacy; and in 1578, John Nelson, a priest, and Sherwood, a young layman, suffered the punishment of death for the same offence. The assumption by Henry VIII. of the title of 'Head of the Church,' notwithstanding the explanation alluded to, was much commented on; and on the accession of Elizabeth, it was thought prudent, while again claiming the supremacy in all causes, as well ecclesiastical as civil, to keep that designation in the background. By successive statutes, the oath of supremacy has been appointed to be taken by the holders of public offices along with the oath of allegiance and of abjuration, and these three oaths have been consolidated into one by 21 and 22 Vict. c. 48. In 1866, a bill was before parliament for imposing a new short form of oath—in place of the oaths hitherto in use to be taken—on members of both Houses of Parliament, in which the royal supremacy in matters ecclesiastical is not in express words specified. See ABJURATION and OATH.

SURABAY'A, a leading seaport of Java, and capital of a residency, is situated on the Kali Mâs mouth of the river Kedirie, near the Strait of Madura, the citadel being in 7° 4′ 30″ S. lat., and 112° 40′ 40″ E. long. Pop. of city and suburbs is about 100,000. The European town is on the west bank, five bridges connecting it with the Chinese and Javan quarters on the east. There are 2 Protestant clergymen, a Roman Catholic priest and assistant, 4 government and 6 adventure schools for Christian children. There are regular steamboat services to Samarang, Batavia, and other places. The steam and sailing vessels belonging to S., in 1864, were 62, and an average of 750 sea-going ships arrive and depart annually. The residency of S. comprises an extensive tract of fertile land in the north-east of Java, and the island of Madura. In 1861, the population numbered 1,218,827, including 4217 Europeans and 7436 Chinese. Rice, coffee, sugar, indigo, cotton, tobacco, and coco-nuts are extensively cultivated.

SURAKA'RTA, a residency of Java, south-east from Samarang, has an area of 2366 sq. m., is fertile and well cultivated, producing rice, maize, sugar, coffee, tea, indigo, tobacco, pepper, cacao, vanilla, and abundance of tropical fruits. In 1861, the population, including 1595 Europeans, amounted to 717,135. The people are proud, and less obedient than in the other residencies, but abjectly submissive to the native emperor, though, in many things connected with his government, he must consult the European resident.

Surakarta, the capital of the empire, and seat of the residency, lies on the left bank of the Solo, in 7° 31′ 30″ S. lat., and 110° 46′ 7″ E. long., covers a large space, and has a population of over 100,000. Many princes and nobles have their palaces in S.; that of the emperor is of great extent and splendour, 10,000 persons, belonging to, or in the service of the royal family, living within the wall. North-east from the royal parks lies the European town, in front of which, surrounded by the parade ground, and commanding the palace, is a square fort, with broad canal and drawbridges at the four curtains, and mounted with 30 pieces of heavy artillery. There is a normal school for training Javanese teachers; a government school, with 80 pupils; and an adventure girls' school, with 40 pupils. A railway is being formed from Samarang to S., by which the produce will be easily conveyed to the port of shipment, and an impulse given to trade and agriculture.

SURA'T (Sans. *Surashtra*, good country), a large but declining city of British India, 150 miles north of the city of Bombay, on the south shore of the Taptí, and 8 miles from its mouth in the Gulf of Cambay. It is 6 miles in circumference, and it is surrounded on the landward side by a brick wall. The river at S. is said to be fordable, although at high tide it can float vessels of 50 tons burden. The English and Portuguese factories, the former now used partly as a lunatic asylum and partly as hospital, are both imposing edifices of great strength and solidity. S. is said to have contained—but this is probably an exaggeration—800,000 inhabitants at the close of the 18th c., about which time its markets were crowded with the costliest wares, brought by merchants from the remotest countries. Its trade and manufactures are now almost extinct, though it still exports cotton and grain to Bombay, and is a place of considerable military strength, and the residence of a British military commandant and other dignitaries. The population is estimated at about 75,000.

S. was long thought to be one of the most ancient cities of Hindustan, but this opinion is now abandoned, and it is believed to have been a mere fishing-village as late as the 13th century. It first rose into importance as the spot whence the Mohammedans of Hindustan embarked on their religious voyage to Mecca. S. was sacked in 1512 by the Portuguese soon after their arrival in India. In 1612, an English force arrived here in two vessels, under the command of Captain Best, who defeated the Portuguese, and obtained a *firman* from the Mogul emperor, authorising the residence of a British minister. The Dutch trade with S. commenced in 1616, when a Dutch factory was established. A French factory was founded in 1668. In the course of time, the English influence began to predominate. In 1759, the castle and fleet were made over to them; and from the year 1800 the government of the settlement has been entirely vested in their hands.

SU'RBASE. See PEDESTAL.

SURD. See IRRATIONAL NUMBERS.

SU'RETY. See GUARANTY.

SURFACE GRUB, the caterpillar of the *Great Yellow Underwing Moth* (*Triphæna pronuba*), a pretty large moth, with the upper wings deep brown or pale tawny, the under wings bright orange with a black border. This moth abounds in hay-fields in Britain at the season of haymaking. The caterpillar, when full grown, is nearly an inch and a half long, pale green with a tinge of brown, dotted with black, three pale lines down the back

and seven black spots on the inside of each of the two outer ones. It often does great mischief to

a Surface Grub; b, Chrysalis; c, the Moth (*Triphæna pronuba*).

the roots of cabbages and turnips, and also devours the roots of grass.

SURF DUCK, or SURF SCOTER (*Oidemia perspicillata*), a species of Scoter (q. v.) extremely plentiful on the coasts of Labrador, Hudson's Bay, and other very northern parts of America, from which great numbers migrate southwards in winter. It is a rare visitant of the coasts of Britain and

Surf Duck (*Oidemia perspicillata*).

other parts of Europe. In size, it is about equal to the Mallard. The plumage is black, except two patches of white on the head and back of the neck. It is never seen on lakes or rivers, but only on the sea-coast. It dives so quickly, that it is very difficult to shoot except when on the wing. Its flesh is rank, and has a fishy taste.

SU'RGEON, Military and Naval, is the second grade attained by a medical officer. Every regiment of cavalry and battalion of infantry, and every ship of war above the size of a gun-vessel, has a surgeon. In the army, the pay of this officer varies with service from £273, 15*s.* to £328, 10*s.* a year, and he ranks as a major. After 20 years' full-pay service (as assistant-surgeon and surgeon) he becomes a surgeon-major, ranking as lieutenant-colonel, and receiving at first £401, 10*s.* a year, and five years later, £456, 5*s.* Naval surgeons have the same rates of pay, the rank of staff-surgeon taking the place of that of surgeon-major. The surgeons rank as naval lieutenants, and the staff-surgeons as commanders.

SURGEONS, College of. The present 'Royal College of Surgeons of England' dates its origin from the year 1460—1461, when Edward IV. 'did, at the supplication of the freemen of the mystery of barbers of the city of London using the mystery or faculty of Surgery, grant to them that the said mystery, and all the men of the same mystery of the said city, should be one body and perpetual community.' In 1500, four Masters in Surgery were appointed, under the title of 'Magistri sive Gubernatores mistere Barbitonsorum et Sirurgicorum' (*sic*), and six years after this date the Barber-surgeons of Edinburgh were incorporated by a charter from James IV. Although the original charter granted to the Company of Barbers of London was confirmed by several succeeding kings, many persons practised surgery independently, and apparently in defiance of the Company; and in order to check unqualified persons, it was enacted in the 3d year of Henry VIII. (1511) 'that no person within the city of London, or within seven miles of the same, shall take upon him to exercise or occupy as a physician or surgeon except he be first examined, approved, and admitted by the bishop of London, or by the dean of St Paul's, calling to him four doctors of physic, and for surgery other expert persons in that faculty.' Hence arose a company called the Surgeons of London. In the 32d year of Henry VIII. (1540), the Company of Barbers of London and the Company of Surgeons of London were united 'by the name of the Masters or Governors of the Mystery and Commonalty of the Barbers and Surgeons of London.' It was not till the 18th year of George II. (1745) that the surgeons of London were by act of parliament separated from the barbers of London, and made a distinct corporation under the name of 'The Master, Governors, and Commonalty of the Art and Science of Surgery of London.' In the 40th year of George III. (1800), this company was dissolved, and replaced with their former and additional privileges by 'The Royal College of Surgeons of London.' A new charter was granted to the college in the 7th year of Victoria (1843), in which it is declared 'that it is expedient to create a new class of members, to be called Fellows,' and 'that from henceforth the corporate name or style of the said college shall be The Royal College of Surgeons of England.' Power was given to the council to elect not less than 250, nor more than 300, members of the college to be Fellows. These 'first Fellows' were mainly elected from the London and provincial hospital surgeons. Other Fellows might subsequently be elected from the members, 'after having complied with such rules and regulations as shall be considered expedient, and after having passed a special examination.' Those who are admitted to the fellowship by examination are distinguished in the college list by the letters *Ex.* being prefixed to their name. By an addition to the charter, obtained in 1852, power was given to the council, subject to certain regulations, to appoint members of 15 years' standing to the fellowship without examination. The college was likewise empowered to test the fitness of persons to practise midwifery and to grant certificates of such fitness; and in 1859 it was similarly authorised to test the fitness of persons to practise as dentists, and to grant certificates of such fitness.

The government of the college is vested in a Council of twenty-four persons, including one president and two vice-presidents; and none but Fellows of 14 years' standing are eligible as members of council. Three members of council go out annually by rotation, and the vacancies are filled up on the first Thursday of July. There is a Court of Examiners consisting of ten members, including a president and two vice-presidents, and as the examiners, who receive large emoluments (the fees to the Court of Examiners for the professional examination of

members for the year ending June 24, 1865, were £2059, 14*s.*), are elected by the council, whose remuneration is slight, a position in the council is eagerly sought for as a stepping-stone to an examinership. Besides the Court of Examiners, there are special boards of examiners in Midwifery, in Dental Surgery, and in Classics, Mathematics, and French for the preliminary fellowship examination. There are two professorships in the gift of the college—viz., that of Human Anatomy and Surgery, now held by Mr Hancock; and the Hunterian Professorship of Comparative Anatomy and Physiology, held for 21 years by Professor Owen, and at present occupied by Mr Huxley. A Hunterian Orator is appointed every second year. The college sends a representative to the General Council of Education and Registration. A candidate for the membership of the college is required to pass a preliminary examination in the usual branches of a liberal education. The fee for the anatomical examination is £5, 5*s.*, and that for the surgical, or pass-examination, is £16, 15*s.*, making a total of £22. The fellowship fee is an additional 10 guineas. For details regarding the course of professional study required both for the membership and the fellowship, the reader is referred to the *Calendar of the Royal College of Surgeons of England*, 1865, which also contains complete lists of the Fellows, Members, Licentiates in Midwifery, and Licentiates in Dental Surgery.

While the movements of the College of Physicians are accurately known, there is considerable doubt as to the various localities occupied in early times by the barbers and surgeons. The Barbers' Hall is, or was, in Monkwell Street, City, but is doomed to fall before civic improvements. Stow, in his *Survey of London*, says there was a 'Chirurgeons' Hall near unto Aldersgate.' In 1596, it is recorded that Dr Paddy was chosen first 'Reader of the Anathomy (*sic*) Lecture at Barber-surgeons' Hall;' but, unfortunately, it is not stated where the hall was then situated. Subsequently, there was a 'Chirurgeons' Hall' in the Old Bailey, from whence the College removed at the commencement of the present century to the site which it now occupies in Lincoln's Inn Fields.

The Museum of the College of Surgeons is incomparably the finest museum of its kind in the United Kingdom. The Hunterian Collection (see HUNTER, JOHN), which forms its basis, was purchased by a parliamentary vote of £15,000, and presented to the college in 1799; and £12,500 more being subsequently voted for a public building, to which upwards of £21,000 were added from the College fund, the edifice in Lincoln's Inn Fields (the germ of the present pile of buildings) was completed, and the Museum was ready for inspection in 1813. Since that time, the building has been twice enlarged. The Hunterian Collection was estimated to consist of 13,682 specimens, of which 215 were microscopic preparations. The total number of specimens in 1865 was 40,701; the additions to the physiological and pathological departments amounting to 15,019, while no less than 12,000 microscopical preparations have been added. The formation of the Library only commenced with the present century; it contains about 35,000 volumes. Both the Museum and Library are readily accessible to visitors. The writer of this article cannot conclude without expressing his obligations to Mr Stone, clerk to the Royal College of Surgeons, for much valuable information.

SU'RGERY. There can be no rational doubt that surgery (Gr. *cheir*, the hand; *ergon*, work, signifying the manual interference, by means of instruments or otherwise, in cases of bodily injury, as distinguished from the practice of medicine, which denotes the treatment of internal diseases by means of drugs) is as old as man himself. Passing over the very little that is known regarding the state of surgery amongst the early Egyptians and the Jews, and the skill ascribed to Chiron and other mythical personages among the early Greeks, we may regard the true history of surgery as commencing with Hippocrates, who flourished in the 5th c. B. C. He was acquainted with the ordinary means of counter-irritation, as issues, a kind of moxa, and the actual cautery. He seems to have performed the capital operations with boldness and success; he reduced dislocations and set fractures, but clumsily and cruelly; extracted the fœtus with forceps when necessary, and both used and abused the trepan. He did not perform lithotomy, the practice of which seems at that time to have been well known, but to have been confined to a few, who made it their exclusive study. From the time of Hippocrates, we may pass over a couple of centuries, when, on the death of Alexander the Great, Alexandria became the great school of anatomy, surgery, and medicine. Herophilus and Erasistratus (300 B. C.) were as distinguished for their surgical skill as for their anatomical knowledge. One member of this school, Ammianus, invented an instrument by which he broke down stones in the bladder, thus anticipating by about 2000 years Civiale's discovery of lithotrity. When the great Alexandrian Library was destroyed by fire, Rome became the head-quarters of science in all its departments. The early Romans of all ranks held surgeons and physicians in abhorrence, and trusted for cures, even in cases of dislocation and fracture, to spells and incantations. The first regular surgeon who settled in Rome was Archagathus (220 B. C.), a student of the Alexandrian School. At first, his skill procured for him a high reputation, but the old prejudices soon revived, and he was banished from the Roman capital. The first Roman surgeon of real merit was Celsus, who flourished at the beginning of the Christian era, who improved the mode of performing lithotomy and amputation, described the operation for cataract, and first recommended the application of ligatures to wounded arteries, for the purpose of arresting hæmorrhage. His works contain an exact representation of surgical knowledge up to his own time. Aretæus of Cappadocia, who practised in Rome during the latter half of the 1st c., was the first to employ blisters, using cantharides (as we still do) for that purpose. Rufus of Ephesus, who lived half a century later, first tied an artery which had become aneurismal in consequence of being wounded in venesection. Galen, who practised in Rome in the latter part of the 2d c., mainly obtained his great reputation by his medical practice. His surgery was confined for the most part to fomentations, ointments, and plasters for external application; to the art of bandaging, and to the employment of complicated machinery in fractures and dislocations. There is little to record for several future centuries. Aëtius, in the 6th c., recommended scarification of the legs in dropsy, tried to dissolve urinary calculi by internal remedies, studied the diseases of the eye, and is the first writer who notices the guinea-worm. Paulus Ægineta, in the 7th c., opened internal abscesses by caustics, improved the operation of lithotomy, described several varieties of aneurism, extirpated the breast, performed laryngotomy and tracheotomy, and was the originator of the operation of embryotomy. His sixth book is regarded as the best body of surgical knowledge previous to the revival of letters. Rhazes, an Arabian, who had charge of a hospital at Bagdad, at the end of the 9th c., was the

first to describe spina bifida, but he did not understand its real nature; he cauterised the bites of rabid animals, and gave a better account of hernia than any of his predecessors. To Avicenna, who lived a century later, we probably owe the first use of the flexible catheter, and of the instrument now generally known as Hey's saw. Albucasis (died 1122) describes an instrument for the cure of fistula lachrymalis, the removal of tumours by ligatures when the knife is inexpedient, the suture of wounded intestines, the use of the probang in obstruction of the gullet, &c., and is the only ancient writer on surgery who describes the instruments used in each special operation. In 1271, Pitard, an eminent surgeon of his time, laid the foundation of the College of Surgeons of Paris. In Great Britain, Gilbertus Anglicanus, who lived about the beginning of the 14th c., is the first known surgical writer; he was shortly followed by John of Gaddesden, author of the *Rosa Anglica*. In the middle of that century, Guy de Chauliac, the first to describe the Cæsarian operation, practised at Avignon; and contemporary with him was John of Ardern, who is regarded as the first surgeon of his time. During the 15th c., the local application of arsenic for cancer was proposed by Taranta, a Portuguese surgeon practising at Montpellier; and lithotomy was removed from the hands of itinerant quacks into the department of pure surgery, by Colot, a surgeon to the French court. Moreover, the College of Surgeons dates from this century, having been founded in 1460—1461; while at the commencement of the next century (1505) the Edinburgh College* was founded. The surgery of the 16th c. may be said to be represented by Ambrose Paré (q. v.). His works, first published in 1535, exerted a most beneficial influence on the profession. Towards the close of this century, Fabricius ab Acquapendente (q. v.), to whom we are indebted for the modern trephine, and for the use of the tube in tracheotomy, published his *Opera Chirurgica*, which passed through 17 editions. Early in the 17th c. (1612), a Scotchman named Lowe published *A Discourse on the whole Art of Chirurgery;* and about fifty years later, Wiseman, who has been appropriately termed 'the Paré of England,' and 'the true father of British surgery,' flourished. He was Serjeant-surgeon to Charles II.; and his surgical works, published in 1676, may still be read with interest. He was the first to dispel the dangerous belief, that gun-shot wounds were of a poisoned nature, and had consequently to be treated with the most painful kinds of dressing. Contemporary with him were James Young of Plymouth, who first performed the flap-operation in amputation; Scultetus (a German), the author of *Armamentarium Chirurgicum;* Frère St Cosme, commonly known as Frère Jacques, a French monk, who considered himself specially commissioned by Heaven to cut for stone, and who has the merit of having converted the tearing into a cutting operation; Rau of Leyden, one of the most successful lithotomists of any age, and a pupil of Frère Jacques; and Roonhuysen, who divided the sternomastoid muscle for wry-neck, and may thus be regarded as the inventor of tenotomy. The 18th c. produced, in England, White, the originator of excision of joints; Cheselden and Douglas, famous as lithotomists; Percival Pott, John Hunter, and Hey of Leeds; in Scotland, Monro, Benjamin Bell, and John Bell; in Ireland, O'Halloran and Dease; in France, Petit and Desault—the former celebrated for his work on Diseases of the Bones, and the latter distinguished for his improvements in surgical instruments of various kinds; in Germany, Richter and the illustrious Haller; and in Italy, Lancisi, Morgagni, and Scarpa. Moreover, in this century (1784) the Royal College of Surgeons in Ireland was founded. Never was surgery so brilliantly represented as during the present century. The London medical schools can point with equal pride to the names of the past generation—to Abernethy, Blizard, Brodie, Astley Cooper, Dalrymple (the oculist), Earle, Guthrie and Hennen (the great military surgeons), Aston Key, Liston, Stanley, Travers, Tyrrell (the oculist), Ware (the oculist), James Wilson, and many other nearly equally celebrated surgeons; and to those of the present—to Arnott, Bowman, Erichsen, Fergusson, Prescott Hewett, Hilton, Lane, Lawrence, Luke, Paget, Spencer Wells, and a host of others, any one of whom would have been pre-eminent a century ago. The Edinburgh schools can boast of Sir Charles Bell, Lizars, Miller, and especially Syme and Simpson (that *par nobile fratrum* of whom any university might well have been proud), the former one of the boldest and most successful of operators, and whose name will be ever associated, in the history of Surgery, with the special amputation of the foot which is known as 'Syme's amputation,' and with the operation for stricture; and the latter claiming a notice in this article as the discoverer of the application of chloroform to surgical practice, and for the introduction of acupressure as a means of checking hæmorrhage. Amongst the past surgical celebrities of Dublin must be mentioned Peile, the inventor of Peile's lithotome and staff; Todd (the father of the late eminent Dr Todd of London), who was the first to successfully revive the treatment of aneurism by compression; Colles, the first to describe the fracture known as Colles's fracture of the radius; Carmichael, distinguished for his opposition to the indiscriminate use of mercury in syphilis; Bellingham, and Hutton, whose names are associated with the full development of the revived treatment of aneurism by compression; Cusack, Porter, M'Dowel, and Sir Philip Crampton; while Adams (well known for his treatise *On the Diseases of the Joints, and Chronic Rheumatism*), R. W. Smith (celebrated for his researches on fractures and neuroma), and Jacob (the discoverer of the *Membrana Jacobi*), still survive. It would be impossible to mention a tithe of the names of those who have attained high surgical celebrity in the provinces during the present century. The Barons Dupuytren and Larrey, and MM. Amussat, Chassaignac, Civiale, Brasdor, Broca, Desmarre (the oculist), Nélaton, Roux, Sichel (the oculist), Velpeau, &c., have honourably sustained the reputation of French surgery. Beer (the oculist), Chelius, Dieffenbach, Von Gräfe (the oculist), Gurlt, Jäger (the oculist), Langenbeck, Stromeyer, and Wützer, constitute but a small portion of the eminent surgeons of Germany. Callisen of Copenhagen, Porta of Pavia, and Pirogoff of St Petersburg, may be taken as the surgical representatives of their respective countries. Amongst American surgeons the names of Valentine Mott, the Warrens, Marion Sims, and Gross deserve special notice. To understand what surgery now is, and to trace its recent progress, the reader should study the standard surgical treatises of Erichsen, Fergusson, Miller, and Syme; and the comprehensive and most valuable *System of Surgery*, edited by Mr Holmes, and contributed to by many of the most eminent authorities

* For much interesting and valuable information regarding this college, the reader is referred to Dr Gairdner's *Historical Sketch of the Royal College of Surgeons of Edinburgh, with Notes and Documents* (Edin. 1860). The same author's *Sketch of the Early History of the Medical Profession in Edinburgh* (Edin. 1864) may also be consulted with advantage.

on surgery. He will also do well to read Fergusson's *Lectures on Conservative Surgery,* and Syme's *Address on Surgery,* delivered before the members of the British Association in August 1865.

With the increase of knowledge, specialities naturally develop themselves; and such has been the case in surgery. The diseases of the eye, the diseases of the ear, the diseases peculiar to women, the diseases of children, and deformities (the treatment of which is termed Orthopædic Surgery), more or less separate themselves, at least in large towns, from general surgery, and constitute special departments, of which dentistry may be considered one; as most of the eminent dentists of the present day are regularly educated and qualified surgeons.

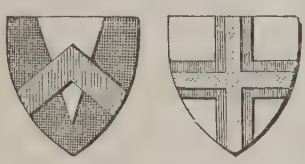
It is deserving of record that within the last few years, nearly all the British universities have commenced to give Surgical as well as Medical Degrees.

For further information on the History of Surgery, the reader is referred to the old histories of Le Clerc (Geneva, 1696) and Freind (Lond. 1725), to Moir's *Outlines of the Ancient History of Medicine,* to Sprengel's voluminous *History of Medicine* (in German), to the admirable 'Historical Notice of Surgery,' in the late Professor Miller's *Principles of Surgery,* and to S. D. Gross's *System of Surgery,* and H. H. Smith's *Principles and Practice of Surgery,* &c., Philada.

SURINA'M. See GUIANA, DUTCH.

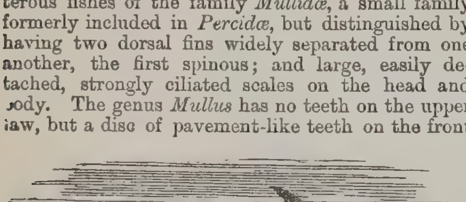
SURINAM BARK. See ANDIRA.

SURMOU'NTED, in Heraldry, a term used to indicate that one charge is to be placed over another



of different colour or metal, as in the annexed figures, which may respectively be blazoned: Sable, a pile argent surmounted by a chevron gules; and, Argent, a cross gules surmounted by another or.

SURMU'LLET (*Mullus*), a genus of acanthopterous fishes of the family *Mullidæ*, a small family formerly included in *Percidæ*, but distinguished by having two dorsal fins widely separated from one another, the first spinous; and large, easily detached, strongly ciliated scales on the head and body. The genus *Mullus* has no teeth on the upper jaw, but a disc of pavement-like teeth on the front



Surmullet (*Mullus surmuletus*).

of the vomer. Two long barbels hang from the under jaw, or, when not in use, are folded up against it. Only two species are known, both abundant in the Mediterranean, and both found on the British coasts. They very generally receive the name MULLET, by which they are confounded with a very different genus. The STRIPED S., or STRIPED RED MULLET (*M. surmuletus*), is sometimes very plentiful on the southern coasts of England, but is rarer towards the north. It approaches the shores in summer, and many surmullets are then taken in mackerel nets; but at other seasons it is only obtained from comparatively deep water by trawl-nets. It sometimes attains, in the Mediterranean, a weight of six or seven pounds, but has never been known much to exceed three pounds in the British seas, and is seldom more than two pounds in weight. The ancient Romans, who held it in the highest esteem, gave prodigious prices for fish of unusually large size. They kept surmullets in their *vivaria*, but there the fish did not increase in size. The colour is pale pink, with three or four yellow longitudinal stripes; but where any of the scales have been rubbed off, beautiful tints of purple and bright red appear, which takes place also during the struggles of the fish when dying, and the Romans were therefore accustomed to bring surmullets alive into their banqueting-rooms, that the guests might see them die, and enjoy the brilliant display of colour, before eating the fish. The liver was regarded as peculiarly delicious, and was bruised in wine to make a *garum* for the flesh. The S. is still regarded as one of the best of fishes.—The RED S., or PLAIN RED MULLET (*M. barbatus*), is very rare on the coasts of Britain. It is a much smaller fish than that already described. Other species of *Mullidæ* are found in tropical seas.

SU'RNAME (either from its being an additional name—Fr. *surnom*, Ital. *sopranome*—or from the practice of writing it over the Christian name, which is to be seen in the court rolls and other ancient muniments), in modern Europe, the family name. The Roman *cognomen* partook somewhat of the same character; but the introduction of the surnames of modern time cannot be traced further back than the latter part of the 10th century. See NAME.

SU'RPLICE (Lat. *super pellicium*, above the robe of fur), a linen or muslin vestment, worn by clerks of all degrees of orders in the discharge of their public religious offices. It is by some supposed to be derived from the longer and more flowing vestment which, in the Roman Catholic Church, is still used in the mass, and is called the 'alb;' but in that church the surplice is worn not alone by priests, but by all who have been admitted even to the church tonsure. Its most ordinary use is for the service of the choir, and it is also employed, along with the stole, by priests in the administration of the sacraments, and in preaching. The use of the surplice was strongly objected to by the Calvinistic and Zwinglian reformers on the continent, and by the Puritans in England, who regarded this vestment as a relic of popery, and made it the subject of vehement denunciations. The argument against it is to be found in Beza, *Tractat. Theolog.*, iii. 29, and its defence in Hooker's *Ecclesiastical Polity,* book v., ch. 29. Within the last twenty years, no little stir has from time to time been created by the use of the surplice by the preacher in the pulpit, contrary to the more general practice in the Anglican Church. Preaching in the surplice has been associated in the popular mind with a Romanising tendency, although it is difficult to say on what basis this association rests.

SU'RREY (Sax. *Suth-rice*, the south kingdom), an inland county in the south of England, bounded on the north by Middlesex, and on the east by Kent. Area, 478,792 acres; pop. (1881) 1,435,842. The middle of the county is traversed from west to east by a well-marked ridge of the North Downs, which

rises in Botley Hill, above Titsey, to the height of 880 feet. On the north side of this range, the land slopes gradually to the banks of the Thames, which runs along the northern border; but on the south side, the descent is rugged and broken, affording pleasing and sometimes romantic scenery. South of the main range, and about four miles south of Dorking, is Leith Hill, 993 feet high, the most important elevation in this quarter of the country. Stretching along the southern bank of the Thames, and extending over a space about six miles in breadth, is a tract which belongs to the London clay formation; further south, and likewise extending from west to east, there is a tract of plastic clay, varying in breadth from one to five miles. Chalk, weald clay, and iron-sand formations occupy the south of the county. The principal streams are the Mole and Wey, tributaries of the Thames. The soil of the northern half of the county is fertile; in the west and south-west, the land is, to a great extent, covered with heath. The climate is soft and mild in low-lying districts, and is favourable to the production of corn and grass. More than four-fifths of the entire area is under culture. In the north, in the vicinity of London, there are numerous market-gardens, the produce of which is sent to supply the markets of the metropolis. Hops, wheat, and the ordinary crops are raised. The county contains much wood, and the beauty of the scenery, and the facility of communication with London, have attracted many residents to S., which is consequently studded over with mansions and villas. Manufactures are carried on in Southwark and in the other southern suburbs of London, as well as in Croydon, Guildford, Kingston, and Reigate, which are the principal towns. The county returns four members to the House of Commons.

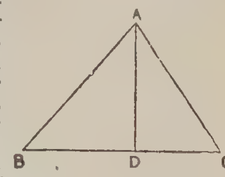
SU'RTURBRAND, a kind of Brown Coal (q. v.) found in the north of Iceland, and there used for fuel. It has a great resemblance to the black oak found in bogs. It is capable of being made into tables and other articles of furniture, but is too brittle to be cut into shavings by a plane.

SURVEY'ING. Land surveying may be considered the earliest practical application of the art of geometry or earth measurement, and must have been in some more or less rude form coeval with agriculture and the division or appropriation of the soil. In Rome, surveying was considered one of the liberal arts, and the measurement of lands was intrusted to public officers who enjoyed certain privileges; and it is probable that the system of measurement practised by them was very similar to our plain surveying with the chain and cross staff of the present day, and has been handed down to us through the feudal period. An examination of ancient records and title-deeds will shew that both areas and boundary-lines of the different enclosures forming fields, hundreds, town-lands, &c., are often laid down with a considerable degree of accuracy.

Land surveying may be considered under the following heads: (*a.*) Plain surveying with the chain, and without the aid of angular instruments, except the cross staff or fixed angle of 90°. (*b.*) Modern engineering surveying, in which angular instruments are used. (*c.*) Coast and military surveying. (*d.*) Trigonometrical surveying (q. v.).

The fundamental rule of every description of land surveying, from the humble attempt of the village schoolmaster to lay down an irregular garden plot, to the trigonometrical survey of a large extent of the earth's surface, when the aid of the most refined improvements of modern science is indispensable, is simply to determine three elements of a triangle, and thence to calculate its area.

In plain surveying with the chain, the three sides of the triangle, ABC, are supposed to be accessible, and are carefully measured on the ground, and then laid down or platted to scale on paper, when an accurate figure of the triangle will be obtained, on which the length of the sides can be marked. To get the area, however, it will be necessary to determine the length of the perpendicular line AD, and this is usually done (when possible) on the ground by means of a simple instrument called a cross, which consists of two sights or fine grooves at right angles to each other, and being placed on the line BC (keeping B and C visible in one of the sights), nearly opposite the angle A, is moved gradually till the angle A is intersected by the other sight. The line AD can be also laid down on the drawing, and its length found by scale, and afterwards verified on the ground, or it may be at once laid down on the ground by the use of the chain alone. An improved reflecting instrument, called an optical square, is also often used for this purpose. Any boundaries along the lines or sides of the triangle, ABC, can be determined by the use of Offsets (q. v.) or insets, as they occur on right and left of line. No matter what the form of the surface to be surveyed may be—polygon, trapezium, or trapezoid—it may thus be determined by a judicious subdivision into triangles; and when the survey is not of a very extended nature or character, and when no serious obstructions exist, chain surveying is both accurate and expeditious, especially if proof or tie lines are properly introduced, for the purpose of testing the accuracy of the work.

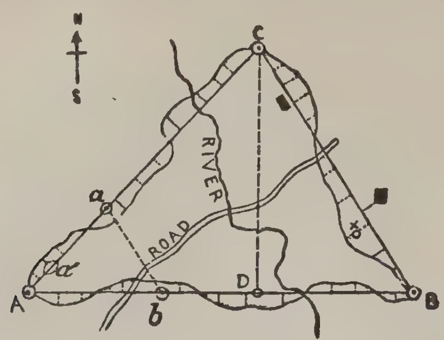


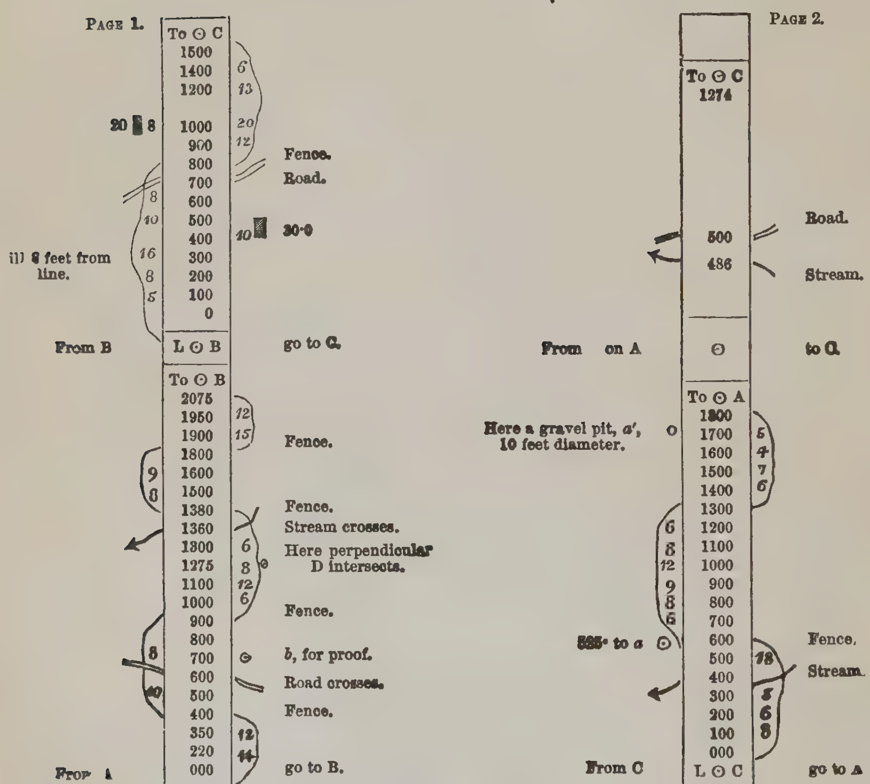
In every description of surveying, it is best to make the original triangle as large as possible, and to work from a whole downwards, rather than build up a large triangle by the addition of several small ones. It would be impossible here to lay down rules to meet the many difficulties which arise in the practice of surveying, and indeed the best test of a good surveyor is the ease with which he will overcome local obstructions, which appear almost insurmountable to a novice, or even to a theoretical surveyor with little field practice.

Where buildings or other impediments are found in the measurement of a straight line, they are generally passed by the erection of short perpendiculars sufficient to clear the obstacles, and a line parallel to the original measured as far as they exist, when the original line can be again resumed. Differences of level, occurring in measuring a line where no instruments are used, are generally compensated or allowed for by the judgment of the surveyor.

In registering the dimensions taken on the ground, such as sides of triangles, offsets, intersections of roads, fences, &c., and everything necessary to make a perfect delineation or plan of the surface, surveyors use what is called a field-book, the mode of keeping which varies very much with individual practice. Some surveyors use hand sketches or rough outlines of the form of the ground, and mark the dimensions on them, while others use the ordinary form of field-book, or a combination of the two methods, which perhaps is the best when any difficult complications happen on the ground, such as the frequent occurrence of buildings, enclosures, water, &c. along the line. In the ordinary field-book, the centre column, commencing from the bottom, represents the length of any line or side of a triangle; and the figures in the column, the distance at which the offsets to the right or left are taken, or where roads

streams, fences, &c. cross the line, or buildings adjoin the same. We give below the field-book of the assumed survey of the triangle ABC, with the different offsets and insets on its sides, and where roads, fences, streams, &c. cross them, the detail of which can be obtained by subdividing the triangle





The line *ab* may be similarly booked and platted, and any lines intersecting shewn.

into smaller internal ones. The figure can thus be laid down from the book, and its area calculated by the formula $\frac{AB \times CD}{2}$, and the offsets and insets calculated, added, or deducted, by the methods given in OFFSETS.

Ponds, plantations, and enclosures of different kinds may be surveyed with a chain, especially if their form be such that they can be conveniently included in the area of a triangle, the correctness of which, being proved by proper tie-lines, the form, area, &c. may be ascertained by offsets, or rather insets from the sides.

SÛRYA is, in Hindu Mythology, the god of the sun. His wife is, in later mythology, *Sûryâ*, who, in order to escape his embraces, transformed herself into a mare, but nevertheless became the mother by him of the twin *As'wins*, afterwards the heavenly physicians. Besides Sûryâ, he had several other wives, by one of whom, *Sanjnâ*, he begot Yama, the god of death, and the river Yamunâ, or Jumna. By Kuntî, before her marriage with Pân'd'u (q. v.), he had *Karn'a*, who, therefore, was an elder brother of the Pân'd'u princes, but in the conflict between the Pân'd'us and the Kurus, sided with the latter, and was killed by Arjuna. S. became also, by his other progeny, the ancestor of a royal dynasty, called after him *Sûryavans'a*, or the solar race. S. is represented with a lotus-flower in his hand, on a

chariot drawn by seven horses, and conducted by his charioteer Arun'a, the god of the dawn, who is represented without legs.

SU'SA (Shushan in Daniel, Esther, &c., derived by some from Shoshan, a lily), probably the modern Sus or Shusn, in lat. 32° 10′ N., and long. 48° 26′ E., situated between the Chapses or Eulæus (Ulai in Daniel), and the Shapur, anciently the capital of Susiana (the *Elam* of Scripture, mod. *Khusistan*), and one of the most important cities of the old world. Its foundation is variously ascribed by ancient writers to Darius Hystaspes, or to Memnon, the son of Tithonus; and its name, together with its ground-plan, is traced on Assyrian monuments at the time of Assur Bani Pal, about 660 B. C. At the time of Daniel's vision 'at Shûshan in the palace,' it was under Babylonian dominion, but came, at the time of Cyrus, under Persian rule; and the Achæmenian kings raised it to the dignity of a metropolis of the whole Persian Empire, and as such Æschylus, Herodotus, Ctesias, Strabo, &c. speak of it. At the Macedonian conquest it was still at its height, and Alexander is reported to have found in it vast treasures, together with the regalia. On Babylon becoming the principal city of Alexander and his successors, S. gradually declined, but seems still to have contained enormous wealth at the time of its conquest by Antigonus (315 B.C.). It was once more attacked by Molo in his rebellion against Antiochus the Great; and during the Arabian conquest of Persia it held out bravely for a long time, defended by Hormuzan. The ruins of its ancient buildings, the palace described in Esther among them, cover a space of about three miles. The principal existing remains consist of four spacious artificial platforms above 100 feet high. Traces of a gigantic colonnade were laid bare by Mr Loftus, with a frontage of 343 feet, and a depth of 244. Cuneiform inscriptions exist, together with many other relics similar to those found at Persepolis (see PERSEPOLIS; compare also CUNEIFORM). The 'tomb of Daniel' shewn near S. is a modern Mohammedan building.

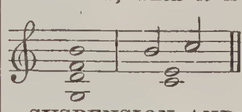
SU'SA, a city of Northern Italy, province of Turin, stands on the right bank of the Dora Riparia, at the foot of the Cottian Alps, 32 miles west of Turin. It is an episcopal see, and has a cathedral consecrated in 1028, with a baptistery of one single block of green marble. Among its other notable buildings are the episcopal palace, the town-hall, and the Borgo de' Nobili. The surrounding country produces wines, fruits, mulberry trees, and wood. The road over Mont Cenis, opened in 1810, begins at Susa. Pop. 4989.

S., called by the Romans *Segusio*, is a very ancient city; it was founded by the Celts, and was in the reign of Augustus the capital of the Celtic chief Cottius, from whom the Cottian Alps received their name, and during the empire was the starting-point for crossing Mont Cenis. A triumphal arch, erected by Cottius in honour of Augustus, still remains.

SUSA'NNAH, HISTORY OF, *The Judgment of Daniel*, also *Susannah and the Elders*, are the different titles of a well-known story, which forms one of three apocryphal additions to the Book of Daniel; the other two being *The Song of the Three Holy Children*, and *The History of Bel and the Dragon* (q. v.). It relates how S., the wife of Joiachim, and daughter of Hilkiah, celebrated alike for her beauty and her virtue, was falsely accused of adultery by certain 'lovers' whose advances she had spurned; and how, being condemned to death on their evidence, she was saved by the wise Daniel, who tore the mask from her enemies, and caused them to experience the fate they had designed for her. The question—not a very important one certainly—has been much debated, both in the early and later times of the church, whether or not the story of S. is true; and arguments (of various weight) have been adduced to shew that the book is a fabrication, a fable, a legend, and a history. The most probable view, perhaps, is that which regards it as a tradition of something that did happen in the life of Daniel, but which has been moulded into a moral fiction by the hand of a literary artist. The original is believed to have been Greek and not Hebrew. In most MSS. it precedes the first chapter of the Book of Daniel, and so we find it in the old Latin and Arabic versions; but the LXX., the Vulgate, the Complutensian Polyglot, and the Hexaplar Syriac, place it at the end of the present book, and reckon it as the 13th chapter.

SUSPE'NSION, in Music. A note is said to be suspended when it is continued from one chord to another to which it does not properly belong, and to a proper interval of which it must eventually give way. Thus we have here the note G extended from the first chord into the second, in which it is first suspended, and then resolved into the chord FACF:

This example is a suspension from above, in which a descent is necessary for its resolution: but a note may also be suspended from below, when it is resolved by an ascent:



SUSPENSION AND INTERDICT, in Scotch Law, is a process by which the suspender, who initiates the proceeding, seeks to stop or interdict some act, or to prevent some encroachment on property or possession, or in general to stay any unlawful proceeding. The first step is to present a note of suspension and interdict to the Lord Ordinary, who grants *interim* interdict either with or without caution, and orders the note to be answered, or refuses interdict. When the note is answered, the Lord Ordinary passes or refuses the note, and continues or recals the interdict as the case may be.

SUSPENSION BRIDGES. In these bridges, the roadway is suspended from chains passing over piers or towers, and firmly fixed at their extremities. Fig. 1 is a sketch of an ordinary

Fig. 1.

suspension bridge. When the roadway is equally loaded over its length, the curve of the chain is a parabola. The weight of the roadway being

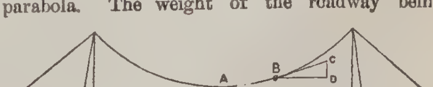


Fig. 2.

known, the strain upon the chain, and its requisite strength, are readily determined. For example, in Fig. 2, if A be the centre of the bridge, and it be

required to find the strain upon the chain at the point B, it is evident that the weight of the roadway between A and B is supported by the chain at B; we have then to find what strain in the direction of the length of the chain, will support this vertical load. By the principles of mechanics, if we draw a right-angled triangle BCD, of which the side BC is a tangent to the curve at B, CD is vertical, and BD horizontal; and if the length of CD represent numerically the load on AB, then BC will represent numerically the strain on the chain produced by that load, and BD will be what is called the horizontal component of this strain. This horizontal part of the strain is the same for every part of the curve; it is the total strain on the chain at the centre A, and the strain carried over the towers and balanced by the backstays, which are firmly anchored to the ground behind them. In this manner the conditions of strength and stability of a bridge uniformly loaded are easily determined, but when we have a rolling load which is heavy in proportion to the weight of the bridge, as for example a railway train, the case is very different, for when the train only occupies one half of the bridge, the chain will be depressed towards that side, and raised at the centre; thus an undulation will be produced in the bridge, which, if the train be moving rapidly, would endanger its stability. Various combinations have been devised to overcome this difficulty. The most simple, and practically the best, is to stiffen the roadway so that the strain of the passing load is distributed over a considerable length of the chain. In this manner, large railway bridges have been constructed in America; among them is that over the Niagara above the Falls, with three lines of rails on it, of which the span is 822 feet, and the height of the platform above the river 250 feet; it is supported by four wire cables each containing 3640 wires. Trains pass over it at the rate of 10 miles per hour. Other plans have been devised for stiffening these bridges, such as stiffening the chain itself, and rendering it rigid; also by using a number of chains, so that one of them may always be in a condition to carry the load without alteration of form. But these methods are bad in principle, and do not give results at all in proportion to their expense. The proper and legitimate use of suspension bridges is to carry ordinary roads over large spans, where the rolling loads are not great in proportion to the weight of the bridge itself, and not very rapid in their motion. Many beautiful examples are to be seen in Great Britain, among others we may instance the Menai Bridge, 580 feet span, and the Clifton Bridge, near Bristol, recently opened, 703 feet span.

SUSPENSION OF ARMS. See TRUCE.

SUSQUEHA'NNA, an American river, which has its origin in Otsego and Canandaigua Lakes, in western New York, and flowing eastward, receives the rivers Unadilla and Chenango, then, turning south, enters Pennsylvania, where it receives the Pittston, the Tioga, the West Branch, and the Juniata, and empties itself into the Chesapeake Bay, at Havre de Grace, Maryland, 400 miles from its source, and 153 from its junction with the West Branch. It is a shallow, rapid, mountain river, with varied and romantic scenery. A canal follows its course, and great quantities of timber are floated down in the spring freshets. Near the mouth, it is famous for waterfowl, especially the Canvasback Duck, and has important fisheries.

SUS'RUTA is one of the great medical authorities of ancient India. See *Medicine*, under SANSKRIT LITERATURE. His work is called *Âyurveda*, and consists of six books. It was edited by Srî Madhusûdana Gupta, in 2 vols. (Calcutta, 1835—1836).

SU'SSEX (South-Saxons), a maritime county in the south of England, bounded on the N. by Surrey and Kent, on the S. by the English Channel, and on the W. by Hampshire. Area, 936,911 acres; pop. (1881) 490,316. The South Downs (see DOWNS) traverse the county from west to east, ending about 20 miles east of Brighton, in the lofty cliff of Beachy Head. The northern escarpment of the Downs is precipitous, but leads down to the fertile and richly wooded district of the Weald (see DOWNS). A remarkably productive tract, from two to seven miles in breadth, extends west from Brighton along the coast to the Hampshire border; and in the south-east of the county the rich marsh lands that line the coast, and which are 30,000 acres in extent, make excellent pasture-grounds. Of the Down-land there are about 50,000 acres, covered with a fine, short, and delicate turf, on which the well-known breed of Southdown sheep, to the number of 300,000, are pastured. Of the Weald district, which formerly was covered with dense forests, there are within the county 425,000 acres; a considerable tract has been brought under cultivation. Irrespective of the less productive districts, there are in the county 120,000 acres of rich arable land; 150,000 acres are occupied by woods, which abound chiefly in the Weald, and in the Forest Ridge in the north-east of S., where are St Leonard's Forest (10,000 acres), and Ashdown Forest (18,000 acres). The chief rivers are the Arun, Adur, and Ouse, which have their origin in the north of the county, and flow south into the Channel. In the south of S. the climate is mild, and several large towns (see BRIGHTON and HASTINGS) are largely resorted to by those who seek health or relaxation. Seaford and Pevensey Bays are much frequented by vessels, and the east portion of the coast is defended by martello towers. The county has for centuries been divided into the six rapes of Lewes, Pevensey, Hastings, Chichester, Arundel, and Bramber. The county returns four members to parliament. Capital, Chichester.

SUSTENTA'TION FUND, a fund provided in the Free Church of Scotland for the support of the ministers of the church. The idea of such a fund was probably derived by Dr Chalmers from the system of the Wesleyan Methodists, and a scheme devised by him was made public before the Disruption, so that arrangements had been made, and a small sum already collected, when that event took place. The scheme was afterwards carried into operation throughout the whole of Scotland, and continues unmodified to the present time. The members of the church are called upon to contribute, according to their own will and ability, to a common fund; of which, after payment of expenses, payments to a fund for widows and orphans, pensions to retired ministers, &c., an equal division is made among the ministers of the church, with a few exceptions, chiefly in the case of newly formed congregations. The amount of the fund has gradually increased from £68,704 in 1843—1844, to £152,112 in 1873—1874. but the dividend from the fund has never quite reached the sum of £150, which has long been aimed at as its desired minimum, the number of congregations having increased. Congregations are permitted to supplement the stipends of their own ministers, and if able are expected to do so. The supplement in some congregations in towns much exceeds the dividend from the fund; but in many parts of the country, the whole, or almost the whole, stipends of the ministers are derived from it. The question has been much discussed, whether so

equal dividend ought to be made, or a proportion established between the liberality of a congregation and the amount paid to its minister. The subject of the Sustentation Fund is of interest not only to the Free Church of Scotland, but to all unendowed churches.

SU'THERLAND, a county in the extreme north of Scotland, is bounded on the E. by Caithness and the North Sea, on the N. and W. by the Atlantic, and on the S. by Ross and Cromarty. Area, 1,207,188 acres; pop. (1881) 23,370, or 12½ per square mile. The coast-line is 60 miles in extent; and the shores, rugged on the north and west, where they are broken by the force of the Atlantic, are comparatively flat on the east. The southern and central regions of S. are the most elevated; and rivers, mostly from the middle of the county, flow east and south-east to the North Sea, and north, north-west, and west to the Atlantic. The principal mountain peaks are Ben More in Assynt (3431 feet), and Ben Klibert (3164 feet). The chief rivers are the Oikel and the Shin—which, with other affluents, unite to form Dornoch Firth—the Brora, Helmsdale Water, and Naver. Extensive moors, the haunt of herds of red deer, stretch across the county; and the rivers and lakes, the chief of which is Loch Shin (q. v.), form numerous low-lying valleys or straths. In the interior and western districts, the climate is cold, and the county is often deluged with continuous rains; but in the eastern districts, the climate is mild, and the soil very fertile in all agricultural produce. In 1868 there were 23,148 acres under crops, of which 8510 acres were under corn, 4180 acres green crops, 5727 clover and other artificial grasses, and 4491 acres permanent pasture. The number of cattle in the same year was 10,794; sheep 221,-613, and swine 1210. In 1868 traces of gold were found in a burn in S., but, though the metal was of excellent quality, the amount was hardly sufficient to repay the labour of the 'diggers.' Granites of various colours, marble, limestone, &c., are found; but these are comparatively valueless on account of their remote situation. Manufactures are inconsiderable. Salmon-fishings are of very considerable value; and the white and herring fishings employ many boats. S. is well supplied with churches; two-thirds of the inhabitants belong to the Free Church, and one-third to the Established Church. The schools are well attended, and a knowledge of English is rapidly spreading, while the Gaelic language is dying out. The whole of the county, except one-twentieth part, belongs to the Duke of Sutherland.

S. received its name from the Northmen, who frequently descended upon and pillaged it prior to the 12th c., and called it the Southern Land, as being the limit on the south of their settlements. The condition of the people of S. before 1811, in which year the county began to be opened up by roads, was miserable. Their sustenance, dependent mostly upon their half-starved flocks, was very precarious, and would have failed them often had not charity administered relief. A former Duke of Sutherland effected what are known as the 'Sutherland Clearances,' by compelling such of his tenants as could not support themselves, owing to the unsuitability to agricultural purposes of the districts upon which they dwelt, either to remove to more fertile districts, where they received land at a merely nominal rent, or to emigrate at his expense to Canada.

SU'TLEJ, or SUTLUJ, an important river in the north-west of India, the eastmost of the five rivers of the Punjab, rises in the sacred lakes of Manasarovara and Rawan-Hrad in Thibet, lat. 30° 45′ N., long. 81° 15′ E. At its outfall from Lake Manasarovara, at between 19,000 and 20,000 feet above sea-level, it is a rapid torrent 30 feet broad. It flows north-west for 150 miles, when turning to the south-west it receives the Spiti or Li, a larger stream than itself. The Spiti is 8592 feet above sea-level, when it joins the S., and the scene of the confluence of the two rivers is sublime in the highest degree. Continuing a south-west course, the S. breaks through the mountain-rampart of the Himalaya, and after flowing in all about 850 miles, in the course of which it is joined by the Beas and the Chenab, it fall into the Indus in lat. about 29° N. Its upper course is supposed to be identical with the Hesudrus, and its lower course (in which it is called the Ghara) with the Hyphasis of the ancients.

SU'TLER is a vendor of provisions allowed by the Quartermaster-general to follow an army in the field, for the purpose of supplying the soldiers with such luxuries as they can afford to purchase. Sutlers are under martial law, accompany the baggage on a march, and are narrowly watched, and severely punished if found guilty of any irregularities towards either the soldiers or inhabitants of the country. In the French army a soldier in each regiment is licensed to act as sutler, and is called *vivandier*. See also CANTEEN.

SÛTRA (from the Sanscrit *siv*, to sew, literally therefore, a thread or string) is, in Sanscrit Literature, the technical name of aphoristic rules, and of works consisting of such rules. The importance of the term will be understood from the fact, that the *groundworks* of the whole ritual, grammatical, metrical, and philosophical literature of India are written in such aphorisms, which therefore constitute one of the peculiarities of Hindu authorship. The object of the Sûtras is extreme brevity; and, especially in the oldest works of this class, this brevity is carried to such an excess, that even the most experienced would find it extremely difficult, and sometimes impossible, to understand these aphorisms without the aid of commentaries, which, however, are fortunately never wanting, wherever a work is written in this style. Though there is no positive evidence as to the cause or causes which gave rise to this peculiarity of Hindu composition, the method of teaching in ancient India—an account of which is afforded in some of the oldest works—renders it highly probable that these Sûtras were intended as memorial sentences which the pupil had to learn by heart, in order better to retain the fuller oral explanation which his teacher appended to them. But it is likewise probable that this method of instruction itself originated in the scarcity or awkwardness of the writing material used, and in the necessity, therefore, of economising this material as much as possible; for that writing was known and practised at the remotest period of Hindu antiquity, is now placed beyond a doubt, though a startling theory was propounded, some years ago, to the effect that writing was unknown in India, even at the time of the great grammarian Pân'ini. The manner, however, in which, up to this day, the Hindus are in the habit of keeping the leaves of their books together, seems to throw some light on the name given to this aphoristic literature. The leaves—generally narrow, and even at the present time often being dried palm leaves, on which the words are either written with ink or scratched with a style—are piled up, and, according to the length of the leaves, pierced in one or two places, when, through the hole or holes, one or two long *strings* are passed to keep them together. The name of Sûtra was probably, therefore, applied to works, not because they represent a thread or string of

rules, but on account of the manner in which these works were rendered fit for practical use; just as in German a volume is called *Band*, from its being 'bound.' That a habit deeply rooted outlives necessity, is probably also shewn by these Sûtra works; for while the oldest works of this class may be called Sûtras by necessity, there are others which convey the suspicion that they merely imitated the Sûtra style after the necessity had passed away, more especially as they do not adhere to the original brevity of the oldest Sûtras; and the Sûtras of the Buddhists (see PIT'AKA), conspicuous for their prolixity, could scarcely lay claim to the term, if compared with the Sûtra of the Brahmanical literature.

SUTTEE' (an English corruption from the Sanscrit *satî*, a virtuous wife) means the practice which prevailed in India, of a wife burning herself on the funeral pile, either with the body of her husband, or separately, if he died at a distance.

The practice of suttee is based by the orthodox Hindus on the injunctions of their S'âstras, or sacred books, and there can be no doubt that various passages in their Purân'as (q. v.) and codes of law *countenance* the belief which they entertain of its meritoriousness and efficacy. Thus, the *Brahma-Purân'a* says: 'No other way is known for a virtuous woman after the death of her husband; the separate cremation of her husband would be lost (to all religious intents). If her lord die in another country, let the faithful wife place his sandals on her breast, and, pure, enter the fire. The faithful widow is pronounced no suicide by the recited text of the R'igveda.' Or the code of *Vyâsa:* 'Learn the power of that widow who, learning that her husband has deceased, and been burned in another region, speedily casts herself into the fire,' &c. Or the code of *Angiras:* 'That woman who, on the death of her husband, ascends the same burning pile with him, is exalted to heaven, as equal in virtue to Arundhatî (the wife of Vasisht'ha). She who follows her husband (to another world) shall dwell in a region of joy for so many years as there are hairs on the human body, or 35 millions. As a serpent-catcher forcibly draws a snake from his hole, thus drawing her lord (from a region of torment), she enjoys delight together with him. The woman who follows her husband to the pile expiates the sins of three generations on the paternal and maternal side of that family to which she was given as a virgin. . . . . No other effectual duty is known for virtuous women, at any time after the death of their lords, except casting themselves into the same fire. As long as a woman (in her successive transmigrations) shall decline burning herself, like a faithful wife, on the same fire with her deceased lord, so lóng shall she be not exempted from springing again to life in the body of some female animal. When their lords have departed at the fated time of attaining heaven, no other way but entering the same fire is known for women whose virtuous conduct and whose thoughts have been devoted to their husbands, and who fear the dangers of separation.' See for other quotations, H. T. Colebrooke, *Digest of Hindu Law*, vol. ii. p. 451, ff. (Lond. 1801); and his 'Essay on the Duties of a Faithful Hindu Widow,' reprinted from the *Asiatic Researches*, in his *Miscellaneous Essays*, vol. i. (Lond. 1837). But however emphatically these and similar passages recommend a wife to burn herself together with her deceased husband, it should, in the first place, be observed, that *Manu*, who, among legislators of ancient India, occupies the foremost rank, contains no words which enjoin, or even would seem to countenance, this cruel practice; and, secondly, that no injunction of any religious work is admitted by the orthodox Hindus as authoritative, unless it can shew that it is taken from, or based on, the revealed books, the Vedas (see S'RUTI). An attempt has of late years been made by Râjâ Râdhakânt Deb, to shew that, in a text belonging to a particular school of the Black Yajurveda (see VEDA), there is really a passage which would justify the practice of suttee; but in the controversy which ensued on this subject between him and the late Professor H. H. Wilson, it clearly transpired that the text cited by the learned Râjâ is of anything but indubitable canonicity; moreover, that there is a verse in the R'igveda which, if properly read, would enjoin a widow not to burn herself, but, after having attended the funeral ceremonies of her husband, to return to her home, and to fulfil her domestic duties; and it seems, at the same time, that merely from a misreading of a single word of this verse from the R'igveda, that interpretation arose which ultimately led to a belief and an injunction so disastrous in their results. See H. H. Wilson, 'On the Supposed Vaidik Authority for the Burning of Hindu Widows, and on the Funeral Ceremonies of the Hindus,' reprinted from the *Journal of the Royal Asiatic Society*, vol. xvi., in his Works, vol. ii., edited by Dr Rost (Lond. 1862). That an immense number of widows have fallen victims to this erroneous interpretation of the oldest Vedic text, is but too true. Some thirty years ago, however, the East India Company took energetic measures to suppress a practice which it was perfectly justified in looking upon as revolting to all human feelings, and which it would have likewise been entitled to consider as contrary to the spirit of the Vedic religion. This practice may now be said to have been successfully stopped; for though, from habit and superstition, even now-a-days cases of suttee occur, they are extremely rare; and all reports agree that the enlightened natives everywhere, except, perhaps, in certain native states, support the action of government to repress this evil of bygone times.

SUTURE (Lat. *sutura*, a seam) is a term employed both in Anatomy and Surgery. In anatomy, it is used to designate the modes of connection between the various bones of the cranium and face. A suture is said to be *serrated*, when it is formed by the union of two edges of bone with projections and indentations (like the edge of a saw) fitting into one another. The coronal, sagittal, and lambdoidal sutures (see SKULL) are of this kind. A suture is termed *squamous*, when it is formed by the overlapping of the bevelled (or scale-like) edges of two contiguous bones. There are also the *harmonia* and the *schindylesis* sutures, the former being the simple apposition of rough bony surfaces, and the latter being the reception of one bone into a fissure of another.

In surgery, the word suture is employed to designate various modes of sewing up wounds, so as to maintain the opposed surfaces in contact. As it may fall to the lot of any person, on an emergency, to have to sew up a wound, the following general rules, applicable to all forms of suture, should be attended to. In passing the needle, the edges of the wound should be held in contact with the forefinger and thumb of the left hand; and the needle should penetrate the surface at about an angle of 50° (rather more than half a right angle), and should, at least, pass through the whole thickness of the skin at each stitch. The distance from the edge of the wound at which each stitch should enter and leave the skin, must vary with the depth of the wound; but there should never be less than the eighth of an inch between the margin of the wound and the entrance or exit

of the needle. Sutures should not include vessels, nerves, muscles, or tendons. The line of the thread should cross that of the wound at right angles.

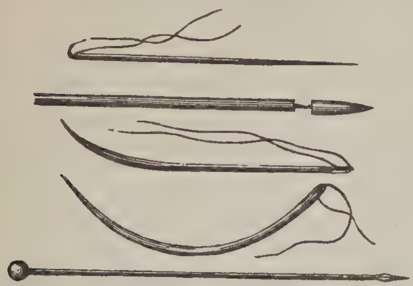


Fig. 1.

For incised wounds on the surface of the body, when the edges can only be transfixed from the cutaneous surface, or when the opposite margins can both be traversed by one plunge, a curved needle (such as a common packing-needle) is most convenient, whereas a strong straight needle is more convenient for the completely free margins of extensive wounds, such as are left after amputation. Fig. 1 represents various forms of needles used by surgeons; fig. 2 shews the *twisted suture*, as used in the operation for hare-lip, in which the wound is transfixed by pins, around which, beginning with the uppermost, a thread is twisted, in the form of the figure 8.

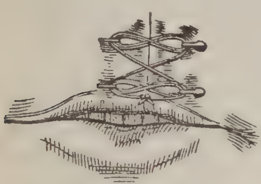


Fig. 2.

SUVOROF, Alexander Vassilivitsh, Count, Prince Italiiski, a Russian field-marshal, and the most famous of Russian generals, was descended from a family of Swedish origin, and was born in Finland, November 13 (O. S.), 1729. His father, who was an officer of the Russian army, and rose, in after-times, to the rank of general and senator, enrolled young S., at the age of 13, in the Semenof regiment, where he remained till 1754, when he was promoted to the grade of lieutenant. S. was present in the Russian army engaged in the Seven Years' War (q. v.), and for distinguished behaviour at Kunersdorf, received the grade of colonel. By a constant succession of eminent services in the Polish civil war (1768), in the war against the Turks (1773—1774), in suppressing internal disturbances, and in subduing the Tartars of the Kuban (1783), he continued to grow in reputation, and rose to the rank of general. In the Turkish war (1787—1792) he was commander-in-chief, for the first time brought the bayonet prominently into use in the Russian army, and decided by it the bloody battle of Kinburn (1787), which would otherwise have been a total rout. At the siege of Otchakof (1788), where he narrowly escaped being made prisoner, the battle of Fokshany (August 1, 1789), which he gained in conjunction with the Austrians, and the decisive victory of Rymnik (September 22, 1789), his headlong bravery, and peculiar system of rapid and repeated attack by overwhelming numbers, secured him complete success. For this last victory, which saved the Austrians under Coburg from annihilation or capture, S. was created, by the Emperor Joseph II., a count of the empire, and from his own sovereign received the title of Count *Suvorof-Rymnikski*. His last great achievement, and the one which has given a predominant colouring to S.'s reputation in Western Europe, was the capture of Ismail (q. v.). S.'s report of his success was couched in the following terms, 'Glory to God and Your Excellency; the town is taken; I am in it.' He was then appointed (1791) governor of the newly conquered provinces; was afterwards sent (1794) to complete the annihilation of the Polish monarchy, which he effected by repeated victories over the Polish armies, the capture of Praga by storm, and the *repossession* of Warsaw (November 19), where a horrible massacre of the inhabitants took place. The grade of field-marshal, and presents of rare value, rewarded these successes. Under Paul, he fell into disgrace (1798), from his impatience of the emperor's fantastic military regulations, and was deprived of his rank; but being restored through English influence, he commanded the Russian auxiliary army sent to co-operate with the Austrians in Italy. In April 1799, he reached Verona; compelled Moreau to retire behind the Adda with immense loss, including more than 8000 prisoners; entered Milan in triumph (April 29); again defeated the French under Macdonald, after a desperate three days' conflict, at the Trebbia (June 17—19), and a third time at Novi (August 15), depriving them of the whole of Northern Italy. His campaign in Switzerland, which promised to bring him face to face with Massena, then the best general in Europe, was rendered abortive by the tardiness of the Austrians, and the Russians, in spite of S.'s remonstrances, were soon after recalled. His escape from the Schackenthal, where he was hemmed in by the French, is considered by many to be the most brilliant and daring retreat ever executed. While on his return to St Petersburg, where a brilliant reception was awaiting him, he fell dangerously ill in Lithuania, and though, on his recovery, he found himself a second time in disgrace, he continued his route, and arrived privately in the capital, where he died sixteen days afterwards, May 17, 1800. His remains were honoured with a magnificent funeral, and the czar Alexander erected a statue to his memory on the Champ-de-Mars. This most extraordinary man had naturally a weak constitution, but rendered it almost invulnerable by exercise, strict temperance, and the regular use of cold baths. His mode of life was of Spartan simplicity, and though the oddity of many of his habits seemed only calculated to encourage ridicule, they, in combination with his paternal care of his men, gave him a powerful hold on the affections of an army at once so ignorant and so thoroughly national in sentiment as the Russian. S. was inflexible in his resolutions and promises, and of incorruptible fidelity. His skill as a general has often been doubted, on the strength of his favourite remark, that all military tactics could be expressed in three words, *stoupai i bi*, 'forward and strike;' but his career shews him to have been possessed of all needful military knowledge—though he hated idle manœuvring—and to have excelled in promptitude and ingenuity of conception, and boldness and rapidity of execution.

SU'ZERAIN (Fr., from Lat. *supremus*), a feudal lord. According to the feudal system, as developed in Northern Europe, every owner of Allodial (q. v.) lands was compelled to acknowledge himself the vassal of a suzerain, and do homage to him for his lands. The term was applied less to the king than to his vassals, who had sub-vassals holding of them.

SWALE. See Yorkshire.

SWALLOW (*Hirundo*), a Linnæan genus of birds

of the order *Insessores*, and tribe *Oscines*, related to the *Tanagridæ*, of several genera forming the family *Hirundinidæ*. This family consists of birds which prey on insects, catching them in the air, and have great powers of flight, now soaring to a great height, now skimming near the surface of the ground or of the water, and wheeling with great rapidity. The bill is short and weak, very broad at the base, so that the gape is wide; the wings are very long, pointed, and more or less sickle-shaped when expanded; the legs are short and weak, and in some —the Swifts (q. v.)—more so than those of any other birds. The tail is generally forked. The plumage is close and glossy. The species are very numerous, and widely diffused, being found in almost all countries. Such of them as occur in the colder parts of the world are summer birds of passage, migrating to warmer regions when winter approaches and insects disappear. The family is divided into two groups, *Swifts*, which have remarkably long and curved wings, very small weak legs and short toes, the hinder toe generally directed forwards, and *Swallows*—some of which are also called *Martins*—having wings not quite so long nor so much curved, rather stronger legs, and longer toes, three before, and one behind. The COMMON S., or CHIMNEY S. (*Hirundo rustica*), exhibits a character

Swallows:
1, Common or Chimney Swallow (*Hirundo rustica*); 2, Sand Martin (*H. riparia*); House Martin (*H. bicolor*).

common to many other species, in the very long and deeply-forked tail, the two lateral feathers of which far exceed the others in length. The plumage is very beautiful, the upper parts and a band across the breast glossy bluish black, the forehead and throat chestnut, the lower parts white, and a patch of white on the inner web of each of the tail-feathers except the two middle ones. The whole length of the bird is about 8½ inches, of which the outer tail-feathers make 5 inches. The nest is made of mud or clay, formed into little pellets and stuck together, along with straw and bents, and lined with feathers. It is open and cup-shaped, and is generally placed in a situation where it is sheltered from wind and rain, as a few feet down an unused chimney, under the roof of an open shed, or in any unoccupied building to which access can be obtained. Two broods are produced in a year. The migration of this and other British species of S., now recognised by all naturalists as an unquestionable fact, was formerly the subject of much dispute, and swallows were supposed by many to become torpid in winter, although it was difficult to imagine that if so they should not frequently be found in that state. The geographical range of this species extends over great part of Europe, Asia, and Africa.—The WINDOW S., or HOUSE-MARTIN (*H. bicolor*, or *Chelidon urbica*), is another very common British species, glossy black above, white below, and on the rump; the feet covered with short downy white feathers, which is not the case in the Chimney S.; the tail long, but its outer feathers not remarkably so. The nest is built of mud or clay, like that of the Chimney S., but is hemispherical, with the entrance on the side, and is attached to a rock, or, very frequently, to the wall of a house, under the eaves or in the upper angle of a window, to the annoyance of housekeepers who prefer the cleanness of their windows to the lively twitter of the birds, and the opportunity of watching their process of nest-building and their care of their young. House-martins congregate in great numbers, as chimney swallows also do before their autumnal migration, and disappear all at once. The house-martin is among the birds of Lapland and Iceland. The only other common British species of S. is the SAND-MARTIN (*H. riparia*), smaller than either of the preceding, the toes naked, the tail moderately forked, the plumage brown on the upper parts and across the breast, the under parts white. It makes its nest in sandy river-banks, the sides of sand-pits and other such situations, excavating a gallery of 18 inches or 2 feet, sometimes 3, or even 5 feet in length, and more or less tortuous, in the extremity of which some soft material is placed for the reception of the eggs. This wonderful excavation is accomplished entirely by the bill of the bird. The floor slopes a little upwards from the entrance, so that the lodgment of rain is prevented. The sand-martin is more local than the other British swallows; but it is distributed over most parts of Europe, Asia, Africa, and North America.—The PURPLE S., or PURPLE MARTIN (*H. purpurea*), is a North American species, which has in a few instances been known to visit the British islands. The general colour, both of the upper and under parts, is shining purplish blue; the wings and tail black. It abounds in North America, and is a universal favourite in the northern parts, being hailed as the harbinger of spring, and frequenting even the streets of towns. It is a very general practice to place boxes near houses for the martins to make their nests in, which are very inartificial, consisting merely of dried grass, leaves, moss, feathers, and the like. Boxes nailed to trees are also readily occupied by the RUFOUS-BELLIED S. (*H. horreorum*), another North American species. But this species, which very nearly resembles the Chimney S. of Britain, makes a nest of mud and fine hay, in the form of the half of an inverted cone, with an extension at the top, for one of the parent birds to sit in occasionally. The REPUBLICAN S., or CLIFF S. (*H. lunifrons*), of North America, makes a nest of mud, in form somewhat like a Florence flask, which it attaches to a rock or to the wall of a house. Hundreds sometimes build their nests in close proximity. The FAIRY MARTIN (*H. Ariel*), a small Australian species, also builds a flask-shaped nest, with the mouth below, attaching it to a rock, or to the wall of a house, and numerous nests are often built close together.—Some of the swallows of tropical countries are much smaller than any of the European species.—The East Indian swallows, which make the Edible Nests (q. v.), belong to the section of the family to which the name Swift is given.

SWALLOWING, THE ACT OF, is accomplished by a set of associated movements which have been divided by physiologists into three stages. In the first stage, the food having been previously duly reduced to a pulp by trituration and insalivation, is

carried back by the contraction of various muscles until it has passed the anterior palatine arch. See PALATE. So far, the movements are purely voluntary. The second stage now commences, during which the entrance of food into the nasal cavities and larynx is most carefully guarded against by certain reflex (involuntary) actions, which have been only clearly recognised since the introduction of the use of the laryngoscope during the last few years. The tongue is carried further backwards, the larynx rises so as to be covered by the epiglottis, which is depressed, and lies horizontally, so that its upper border touches the posterior wall of the pharynx. Coincident with these movements, the sides of the posterior palatine arch contract by muscular action, and approach each other like a pair of curtains, so as almost to close the passages from the fauces into the posterior nostrils; the closure being completed by the uvula. A sort of inclined plane is thus formed, and the morsel slips downwards and backwards into the pharynx, which is raised to receive it. Very little, if any, voluntary action is here exerted. The third stage—the propulsion of the food down the œsophagus—then commences; and this process is effected in the upper part by means of the constrictor muscles of the pharynx, and in the lower, by the muscular coat of the œsophagus itself. At the point where the latter enters the stomach, there is a sort of sphincter muscle, which is usually closed, but which opens when sufficient pressure is made on it by accumulated food, closing again when this has passed.—See Carpenter's *Principles of Human Physiology*, 6th ed. p. 61.

SWALLOW-WORT. See ASCLEPIAS.

SWAMMERDAM, JAN. See SUPP. in Vol. X.

SWAN (*Cygnus*), a genus of birds of the Duck (q. v.) family (*Anatidæ*), constituting a very distinct section of the family. They have a bill about as long as the head, of equal breadth throughout, higher than wide at the base, with a soft cere, the nostrils placed about the middle; the neck very long, arched, and with 23 vertebræ; the front toes fully webbed, the hind toe without membrane; the keel of the breast-bone very large; the intestines very long, and with very long cæca. They feed chiefly on vegetable substances, as the seeds and roots of aquatic plants, but also on fish-spawn, of which they are great destroyers. They are the largest of the *Anatidæ*. They have a hissing note like geese, which they emit when offended, and strike with their wings in attack or defence. The common notion, that a stroke of a swan's wing is sufficient to break a man's leg, is exaggerated. The COMMON S., MUTE S., or TAME S. (*C. olor*), is about 5 feet in entire length, and weighs about 30 lbs. It is known to live for at least 50 years. The male is larger than the female. The adults of both sexes are pure white, with a reddish bill; the young (cygnets) have a dark bluish-gray plumage, and lead-coloured bill. The bill is surmounted by a black knob at the base of the upper mandible, and has a black nail at its tip. In its wild state, this species is found in the eastern parts of Europe and in Asia; in a half-domesticated state it has long been a common ornament of ponds, lakes, and rivers in all parts of Europe. It is an extremely beautiful bird, when seen swimming, with wings partially elevated, as if to catch the wind, and finely curving neck. The ancients called the S. the Bird of Apollo or of Orpheus, and ascribed to it remarkable musical powers, which it was supposed to exercise particularly when its death approached. It has, in reality, a soft low voice, plaintive and with little variety, which is to be heard chiefly when it is moving about with its young. The nest of the S. is a large mass of reeds and rushes near the edge of the water, an islet being generally preferred. From 5 to 7 large eggs are laid, of a dull greenish-white colour. The female S. sometimes swims about with the unfledged young on her back; and the young continue with their parents till the next spring. The S. is now seldom used in Britain as an article of food, but in former times it was served up at every great feast, and old books are very particular in directions how to roast it and to prepare proper gravy.—The POLISH S. (*C. immutabilis*), of which flocks have occasionally been seen in Britain in winter, differs from the Common S. in its orange-coloured bill, in the smaller tubercle at its base, and in the shape and position of the nostrils. The young are also white, like the adults. It belongs chiefly to the north-eastern parts of Europe. Many naturalists regard it as the true wild state of the Common Swan.—The WHISTLING S., ELK S., or HOOPER (*C. ferus*),

Wild Swan, or Hooper (*Cygnus ferus*), and Black Swan (*C. atratus*).

abounds in the northern parts of Europe and Asia. Flocks frequently visit Britain in severe winters, and their migrations extend as far south as Barbary. A few breed in the Orkney Islands, but the greater number in more northern regions. The size is about equal to that of the Common S., and the colour is similar, but the bill is more slender, is destitute of knob, and is black at the tip, and yellow at the base. This bird is frequently brought to the London market. The names Hooper and Whistling S. are derived from the voice. The anatomical differences between this species and the Common S. are more considerable than the external, particularly in the double keel of the breast-bone forming a cavity which receives a long curvature of the windpipe.—BEWICK'S S. (*C. Bewickii*), another native of northern Europe, is more rare in Britain, but flocks are sometimes seen. It is about one-third smaller than the Whistling Swan.—The AMERICAN S. (*C. Americanus*) nearly resembles Bewick's Swan. It breeds in the northern parts of North America, and its winter migrations extend only to North Carolina.—The TRUMPETER S. (*C. buccinator*) is another American species, breeding chiefly within the Arctic Circle, but of which large flocks may be seen in winter as far south as Texas. It is rather smaller than the Common Swan.—The ancients spoke of a black S. proverbially as a thing of which the existence was not to be supposed, but Australia produces a BLACK S. (*C. atratus*), rather smaller than the Common S., the plumage deep black, except the primaries of the wings, which are white. The bill

is blood-red. It has been introduced into Britain, and breeds freely. It is very abundant in some parts of Australia.—The BLACK-NECKED S. (*C. nigricollis*) is a South American species, as is the DUCK-BILLED S. (*C. anatoides*), the smallest of all the species, white, with black-tipped primaries, common about the Strait of Magellan. It is a curious circumstance that the black colour appears more or less in all the species of the southern hemisphere, and in them alone, except in the approach to it made in cygnets.

Swans, according to the law of England, are birds-royal. When they are found in a partially wild state, on the sea and navigable rivers, they are presumed to belong to the crown, and this is one of the prerogatives of the crown, though it may be delegated to a subject. The royal birds generally have a mark on them, and the king's swan-herd once was an important person. A subject is not entitled to have a swan-mark unless he has a qualification of land, and has a grant from the crown, or prescriptive use. But any person may have swans in his grounds in a tame state, and then he has a property in them. Whoever steals or destroys swans' eggs, forfeits 5*s.* for every egg, and whoever steals a marked swan of the crown, or a tame swan, commits felony. In Scotland, there is some trace of the bird having been once treated with royal honours, but latterly they have been in the category of other tame birds.

SWA'NSEA (Welsh, *Abertawy*), a market-town, municipal and parliamentary borough and seaport of the county of Glamorgan, South Wales, stands on the right bank and at the mouth of the Tawe, 60 miles west-north-west of Bristol. The harbour is formed by means of piers of masonry, projecting from either side of the mouth of the Tawe into Swansea Bay, a wide inlet of the Bristol Channel. The vast resources of the coal-field in the midst of which the town is situated, began to be explored and turned to commercial account about the year 1830; and since that time the progress of S. has been so rapid, that it is now (1875) the most important town in South Wales. The houses and public edifices and institutions are of recent erection. A new and costly market-place was opened in 1830, and a new fish-market in 1847. Smelting and refining copper is the staple trade of the town, and the chief source of its prosperity. The coal obtained in the vicinity is peculiarly adapted for smelting purposes, and great quantities of ore are brought hither to be smelted, not only from the copper-mines of Britain, but from Cuba and the west coast of South America. In the immediate vicinity of the town, there are smelting-works, in which about 185,800 tons of copper, copper ores, silver ores, and zinc ores (equal in value to about £4,000,000) are smelted annually. In 1859, a large floating dock, 13 acres in extent, was opened by the side of the harbour. Its north side is lined with warehouses and staiths for the shipment of coals, which are brought to the wharfs by the South Wales, the Vale of Neath, the Swansea Valley, and the Swansea and Llanelly Railways. Patent fuel, composed of a mixture of culm and tar, and compressed into the shape of bricks, is an important article of manufacture and trade. There are extensive potteries and tin, silver, and china works, breweries, rope-walks, and tanneries. Of the whole amount of copper manufactured in Great Britain, seven-eighths are smelted at S. and in its immediate vicinity. In 1867, 14,559 vessels, of 1,812,911 tons, entered and cleared the port. There are abundant means of communication landward by canals and railways. Pop. (1851) of municipal and parliamentary limits, 31,461; (1861) 41,606; (1881) of municipal borough, 63,739; of parliamentary district of boroughs, 105,949. Of the old castle of S., the ruined remains are used as a military store. S. unites with several other boroughs in sending a member to the House of Commons.

SWARGA is the paradise of the Hindu god Indra (q. v.). It is the residence of some of the inferior gods and deified mortals, who there rest in the shade of the five wonderful trees—*Mandâra*, *Pârijâta*, *Santâna*, *Kalpavr'iksha*, and *Harichandana;* drink *Amr'ita*, or the beverage of immortality; and enjoy the music of the *Gandharvas*, and the dancing of the heavenly nymphs, the *Apsarasas*.

SWARMING, a peculiar mode of reproduction which has been observed in some of the *Confervaceæ*, *Desmideæ*, &c. The granules which form the green matter in the plant, or in one of its joints, become detached from each other, and move about in the cell with great rapidity. The external membrane swells in one point, and finally bursts there, when the granules escape into the surrounding water to become new plants. At first, they issue in great numbers, but those which remain last, move about within their cell for a long time before they find the way out. Their motion is supposed to be due to cilia. After escaping, the most of them finally become grouped together in little masses on some substance, before beginning to vegetate.

SWATOW, China. See SUPPLEMENT in Vol. X.

SWE'ABORG, or SVE'ABORG, a great Russian fortress in the principality of Finland, and government of Viborg, sometimes called 'the Gibraltar of the North,' protects the harbour and town of Helsingfors, from which it is only 3 miles distant. The fortifications extend over seven islands, the *Nylandischen Skären*, but the grand central point is the island of Wargöe. The islands are connected with each other by means of bridges, and between two of them lies the single narrow entrance to the harbour, which can hold from 70 to 80 ships of the line. S. has a civic population of about 3000, the greater part of whom are manual labourers, ship-carpenters, and traders, and a garrison of some 5000 men (including women and children). During the Crimean war, the Anglo-French fleet in the Baltic made a reconnaissance of the place, and bombarded it for two days (9th and 10th August 1855), but found the defences too formidable to be reduced by the means at their disposal.

SWEARING, PROFANE, according to the law of England, is an offence for which the party may be convicted by a justice of the peace according to a scale of penalties. A day labourer, common soldier, sailor, or seaman forfeits 1*s.* per oath; every other person under the degree of a gentleman, 2*s.*; and every person above the degree of a gentleman, 5*s.*—for a second offence, double these sums; for a third, treble, &c. If the cursing takes place in presence of a justice of the peace, the latter may convict the swearer then and there, without further process or evidence; and in all cases a constable may apprehend a profane swearer, and carry him before a justice. On a recent occasion, a man swore a volley of oaths, twenty times repeating the oath, and the justices fined him 2*s.* for each repetition, making in all £2, and this was held a proper conviction. The justices of the peace in Scotland have a similar jurisdiction intrusted to them, to convict of profane swearing, and fine according to the rank of the party.

SWEAT (A.-S. *swat;* Sansc. *swai las;* Lat. *sudor;* Gr. *hydor*, moisture; Lat. *ud(us)* = wet), or Perspiration. The nature, composition, and uses of this fluid in the normal state have been

sufficiently noticed in the article SKIN. It may be additionally remarked, in connection with the physiology of sweat, that the composition of this fluid varies materially according to the part of the body from which it is secreted. Thus Funk found the sweat of the feet was richer in fixed salts than that of the arm, in the ratio of 5 to 3; and Schotten found a considerable preponderance of potassium in the former. In the negro, Dr Copland and other observers have found that both the gaseous exhalations from the skin, and the solid matters contained in the sweat, were much greater than in the white races. It has been shewn in the article SKIN that the sweat-glands, like the lungs and kidneys, act as depurating organs, and separate and carry off effete matters from the blood. This eliminating action of the skin is modified in various diseases; in some cases being diminished, as in the early stage of fevers, in inflammations before suppuration commences, in scurvy, diabetes, sun-stroke, &c., while it is more or less increased in the sweating stage of ague, in acute rheumatism, in Asiatic cholera, in certain adynamic fevers, in the advanced stages of pulmonary consumption, in the formation of matter in internal parts, &c. The sweat is naturally acid in health, but in prolonged sweating the secretion becomes neutral, and finally alkaline. Little is known with certainty regarding the colouring matters of sweat. In cases of jaundice, the sweat sometimes communicates a yellow tinge to the body-linen; and instances of blue, red, and bloody sweat are on record. Cases of sweat of these colours are recorded in Simon's *Animal Chemistry* (Syd. Soc. Trans.), (Lond. 1845), vol. ii., p. 110. Cases of unilateral sweating, stopping abruptly at the middle line, have been occasionally noticed, especially in aneurism of the aorta.—See Gairdner's *Clinical Medicine*, p. 557. Dr Druitt has recently pointed out the use of hot water as a remedy for profuse perspiration. He has found it serviceable in (1) oversweating in good health and hot weather; (2) undue sweating in special parts of the body, as the hands, feet, or armpits; (3) true hectic; and (4) ordinary night sweats in phthisis not preceded by hectic symptoms. To be of any service, the water must be applied at as great a heat as the patient can possibly bear (see his paper on this subject in the *Medical Times* for March 4, 1865). For a very interesting and learned discussion on our Saviour's bloody sweat during his Passion, the reader may consult Stroud *On the Physical Cause of the Death of Christ*, and Trusen's chapter *Von dem Blutschweisse Christi* in his *Darstellung der Biblischen Krankheiten*, 1843.

SWEATING SICKNESS, THE, is the term given to an extremely fatal epidemical disorder, which ravaged Europe, and especially England, in the 15th and 16th centuries. It derives its name 'because it did most stand in sweating from the beginning vntil the endyng,' and 'because it first beganne in Englande, it was named in other countries the Englishe sweat.'—*The Boke of Jhon Caius against the Sweatyng Sicknes.* It first appeared in August, 1485, in the army of Henry VII., shortly after his arrival at Milford in South Wales from France, and in a few weeks it spread to the metropolis. It was a violent inflammatory fever, which, after a short rigor, prostrated the powers as with a blow; and amidst painful oppression at the stomach, headache, and lethargic stupor, suffused the whole body with a fœtid perspiration. All this took place in the course of a few hours, and the crisis was always over within the space of a day and night. The internal heat which the patient suffered was intolerble, yet every refrigerant was certain death. *Scarce one amongst a hundred* that sickened did escape with life.'—Holinshed, vol. iii., p. 482. Two lord mayors of London and six aldermen died within one week; and the disease for the most part seized as its victims robust and vigorous men. It lasted in London from the 21st (some authorities say the middle) of September to the end of October, during which short period 'many thousands' died from it. The physicians could do little or nothing to combat the disease, which at length was swept away from England by (as many supposed), a violent tempest on New-Year's Day. The disease did not reappear till the summer of 1506, when it broke out in London, but does not seem to have occasioned any great mortality. In July 1517, it again broke out in London in a most virulent form; it being so rapid in its course that it carried off those who were attacked in two or three hours. Amongst the lower classes, the deaths were innumerable, and the ranks of the higher classes were thinned. In many towns a third, or even a half of the inhabitants were swept away. On this occasion, the epidemic lasted about six months. In May 1528—the year in which the French army before Naples was destroyed by pestilence, and in which the putrid fever known as *Trousse-galant* decimated the youth in France—the sweating sickness again broke out in the metropolis, spread rapidly over the whole kingdom, 'and fourteen months later, brought a scene of horror upon all the nations of Northern Europe, scarcely equalled in any other epidemic.'—Hecker's *Epidemics of the Middle Ages* (Syd. Soc. Trans.), p. 238. How many lives were lost in this epidemic, which has been called by some historians *the great mortality*, is unknown; but the mere fact that the king (Henry VIII., who, whatever his faults, was never accused of cowardice) left London, and endeavoured to avoid the disease by continually travelling, shews the general feeling of alarm that existed. In the following summer (July 25, 1529), having apparently died out in England, it appeared in Germany, first at Hamburg, where it is recorded that 8000 persons died of it, and shortly after at Lubeck, Stettin, Augsburg, Cologne, Strasburg, Hanover, &c. In September, it broke out in the Netherlands, Denmark, Sweden, and Norway, whence it penetrated into Lithuania, Poland, and Livonia. By January of the following year, after an existence of three months, it had entirely disappeared from all these countries. For three-and-twenty years the sweating sickness totally disappeared, when for the last time (April 15, 1551) it burst forth in Shrewsbury. The banks of the Severn seemed to be the focus of the malady which was carried from place to place by poisonous clouds of mist. There died within a few days 960 of the inhabitants of Shrewsbury, the greater part of them robust men and heads of families. The disease spread rapidly over the whole of England, but seems to have disappeared by the end of September. The deaths were so numerous, that one historian (Stow) states that the disorder caused a *depopulation* of the kingdom. The very remarkable observation was made in this year, that the sweating sickness uniformly spared foreigners in England, and on the other hand, followed the English into foreign countries. The immoderate use of beer amongst the English was considered by many as the principal reason why the sweating sickness was confined to them. 'By the autumn of 1551,' says Hecker, 'the sweating sickness had vanished from the earth; it has never since appeared as it did then and at earlier periods; and it is not to be supposed that it will ever again break forth as a great epidemic in the same form, and limited to a four-and-twenty hours' course; for it is manifest that the mode of living of the people had a great

share in its origin, and this will never again be the same as in those days. — *Epidemics of the Middle Ages* (Syd. Soc. Trans.), p. 306.

SWE′DEN (*Sverige*), the eastern portion of the Scandinavian peninsula, constitutes with Norway (q. v.) one joint kingdom. It is situated in 55° 15′ - 69° N. lat., and 11°—24° E. long., and is bounded on the N. and W. by Norway; on the extreme S.W. and S. by the Cattegat, which separates it from Denmark; on the S.E. and E., as far as 66° N. lat., by the Baltic; and from thence to the extreme N. by Russia. The area is given at 170,629 sq. m.; and the pop. was, in 1880, 4,565,668. Its length is upwards of 900 miles, and its greatest width from 150 to 200 miles. Unlike Norway, S. possesses few high mountains, but contains numerous lakes of large dimensions. The coast skirting the Baltic, and the adjoining islands, are for the most part low and sandy, although in some parts, as in the vicinity of the outlet of Lake Maelar into the sea (in about 58° N. lat.), the shores are rocky; and on the south and west coasts, it is only at isolated spots, as near Gottenborg, that the generally low, sandy, or alluvial lands are replaced by more rocky formations.

In the northern parts, the land rises gradually from the Gulf of Bothnia to the Kiölen Mountains, which form the boundary between S. and Norway. South of 62° N. lat., the slope is directed southward, attaining its lowest level in the vicinity of the three great lakes of Wener, Maelar, and Hielmar, which nearly intersect the country from east to west; and south of these great inland waters, the surface is in general level, though ranges of high ground and detached hills occur.

The mountainous region of S. may, moreover, be considered to be divided into three distinct parts, viz., the northern or alpine part, the central or lake district, and the southern or mining district. The first of these comprises the Kiölen range, the most elevated parts of which are above the line of perpetual snow. The rivers do not admit of navigation, and the inhabitants of this district, whose means of living are principally derived from the rearing of cattle, can have little intercourse with the natives of other parts of the country. The central portion of the mountain-district comprises the great tablelands of Jemtland, and the valleys of Herjedal and Ljungan, which admit of higher cultivation, while the banks of the numerous small lakes and rivers afford good pasturages for cattle and sheep, and the slopes and summits of the hills yield timber of good quality. In the southern part of the mountain-tract lies the region of mines, which extends from Norway to the Gulf of Bothnia, and is bounded to the north by Lake Siljan, and to the south by Lake Wener. This district includes the famous iron mines of Danemora and the copper-works of Fahlun, besides many others of great importance; and although not generally fertile, the soil is carefully cultivated for the supply of the mining population, which, during the last few years, has been considerably augmented.

To the south of this region of mines lies the only level and fertile tract, in which wheat can at all times be advantageously and extensively cultivated. This agricultural district, which includes some of the larger lakes, consists of level meadow and arable lands, and extensive table-lands, traversed by wooded ridges, and is the only part of S. which can be said to be free from the huge masses of erratic rocks, chiefly gneiss, which occur in such large numbers over almost the whole of the Scandinavian peninsula. The coast of this central portion of S. is fringed with long lines of disjointed cliffs or islands, separated from one another by numerous narrow passages, whose intricate windings render access to the shore tedious and difficult. The peninsular extremity of S., which lies between the Cattegat and the Baltic, includes some of the most fruitful and picturesque districts of the kingdom.

The lakes of S., which are very numerous, have been computed to cover nearly ⅛th of the entire area of the country. The largest of these, Lake Wener (q. v.), is fed by the river Klar, and emptied into the Cattegat by the Göta. The Göta, which is noted for its picturesque rapids, and the falls known as the Ränum and Trolhätten, has, by means of the admirable system of canals and locks designed by the English engineer, Telford, been made conducive to the line of internal navigation which now connects the Cattegat with the Baltic. Lake Wetter (q. v.) is included in this great scheme of inland navigation, but the heavy gales to which both this lake and Lake Wener are subject, often render their navigation difficult and dangerous. The Maelar (q. v.) Lake extends along a length of 70 miles, and continues this system of water communication eastward to the shores of the Baltic.

The rivers of S. have generally so short and rapid a course that it is only by art that they can be rendered navigable. The largest of these is the Angerman River or Elv, formed by the junction of four parallel streams, which, after passing through some of the large alpine lakes, empties itself into the Gulf of Bothnia, which also receives the Ljungan, Indal, Ljusne, Dal, Umea, Pitea, Lulea, Tornea, &c. The course of these rivers is generally directed from north-west to south-east, and many of them being swelled by the affluence of numerous mountain streams, merge into tarns, or expand into extensive alpine lakes; and although of little practical utility for direct navigation, they afford the greatest facilities for internal navigation, and for conducting manufacturing operations by water-power.

The differences of climate in S. are necessarily very great, considering that its most northern parts are more than 2° within the polar circle, and its southern extremity 11° south of it, besides being so nearly surrounded by seas and lakes as to have nearly the conditions of an insular position. Great extremes of temperature are common in different parts of S.: thus, while Stockholm has a mean annual temperature of 42°·2 Fahr., and Gottenborg 46°·3, the summer temperature of the former is 60°·4 Fahr., and that of the latter 62°·13; and the winter temperature of the former only 25°·8, and that of the latter 31°·5 Fahr.

The heat of the summer, which is scarcely separated from the cold of the winter by either spring or autumn in the extreme northern districts, enables the inhabitants to cultivate barley, which is reaped within two months of the time of its sowing, although even the hardier cereals, as oats and rye, will not ripen above the parallel of 66° N. lat.. Indeed, the climate of S. generally is unfavourable to the growth of grain, the annual yield of which frequently falls short of the wants of the population. The principal articles of cultivation are, in addition to the various cereals, potatoes, hemp, flax, tobacco, and hops, which are generally grown in sufficient quantities for home consumption. The pine, fir, and beech, met with even in the most northern parts of the country, at the respective elevations of 3000, 2500, and 1800 feet above the level of the sea, are of great importance, not only for the timber, tar, and pitch which they yield, but also on account of their supplying charcoal and firewood, which, in the absence of coal, constitute the principal kinds of fuel. The forests are of great extent, covering more than a fourth part of the surface of S.,

although the greater portion of the land lying north of 64° is destitute of trees, as are also the alpine slopes at elevations of 3000 feet above the sea, where stunted bushes, berries, dwarf-plants, and lichens are the only forms of vegetation to be met with. The common fruit-trees, as cherries, apples, and pears, grow as far north as 60°, but the fruit seldom comes to great perfection except in the southern provinces; cranberries and other berries abound, however, in all parts of the country. Bears and beavers, which were formerly often met with, are becoming scarce; but wolves, lynxes, foxes, martens, squirrels, eagles, &c., are still common; while the elk and deer are found in some of the forests, which abound in hares, woodcocks, black-cock, and various other kinds of small game; and Lemmings (q. v.) occasionally descend from the mountains in large numbers, and lay waste the low country. The lakes yield a great abundance of fish, 88 different kinds of sea and fresh water fish being brought to market.

The mineral products of S., which are extremely rich, include some gold and silver (which, however, do not pay the cost of working), copper in abundance, iron of the finest quality in almost every province, alum, vitriol, marble, sulphur, lead, nickel, zinc, and some coal of very inferior quality.

Next to agriculture, mining constitutes the most important branch of national industry, and in some provinces is the principal employment. The Danemora mines, in Upsala Laen, yield a metal which is capable of being converted into the finest steel. S. had, in 1869, 2195 factories, employing 26,042 labourers. The value of the manufactures amounts yearly to 82,321,000 rixdaler. Iron is mined from 461 mines, 340,000 tons of pig iron are made at 200 furnaces, and 211,000 tons of iron rolled at 375 rolling works.

Shipbuilding forms an extensive branch of local industry. The merchant marine numbered, in 1872, 3878 vessels, of 425,973 tons, of which 498 were steamships, of 16,292 horse-power. The number of vessels employed in internal navigation in 1872 was 1783, with a tonnage of 334,592. Of railways 2090 were completed in 1874, and 1292 miles were in course of construction.

The chief articles of export are iron and timber, copper, cobalt, alum, hemp, oil, birch-bark, hides, furs, paper, tobacco, home-spun linens, pitch and tar, &c. The Baltic lands, Great Britain, France, Portugal, and the Brazils take the greater part of these articles. The imports include yarn, wool, cotton, leather, coals, salt, machines, manure, and the ordinary colonial produce. The value of the imports in 1872 was 216,366,000 rixdaler, or about $54,091,500, and that of the exports 199,815,000 rixdaler, or about $49,953,750.

In 1858 the decimal system was introduced into S., when the standard foot, which was retained, was divided into ten inches of ten lines, and the old standard pound made the basis of the hundredweight of 100 pounds. The rixdaler rixmynt (=100 oere, or about 1*s.* 2*d.*) has, in accordance with the decree of 1855, been made to supersede the old rixdaler banco of 150 oere.

The total estimated receipts and expenses, according to the budget for the year 1875, amount to 99,249,939 rixdaler = £5,458,746, or $26,529,500, of which the ordinary receipts are 25,135,000 rixdaler; ordinary expenses, 51,836,800 rixdaler; extraordinary receipts, 39,640,000; expenses, 28,447,108; income from loans, &c., 34,474,939; interest on public debt, and other expenses, 18,966,031 rixdaler. During the 6 years from 1865 to the end of 1870, the diet voted 100 million rixdaler for the construction of railroads. Until the year 1857, S. had no external foreign debt; but at the close of 1873 the sum total of the national debt was 89,840,000 rixdaler, or about $22,460,000.

S. is divided into three great provinces—viz., Norrland, the largest and most northerly; Sweden Proper, or Svea-Rike, in the centre; and Gotland, or Gotha-Rike, to the south. These divisions, of which the last two derive their names from the respective nations or tribes by whom they were originally settled, are now merely nominal, and have ceased to indicate any municipal districts since the whole of S. was divided into Laens, or administrative circles, of which there are 25, which are under the jurisdiction of special magistrates, and are further subdivided into bailiwicks, hundreds, and parishes.

With the exception of Stockholm (q. v.), the capital, and Gottenborg (q. v.), there are only two towns with more than 20,000 inhabitants, and seven other towns with populations of more than 8000.

The only Swedish colony is the small island of St Bartholomew, in the group of the Lesser Antilles, which is only about 20 sq. m., with 2800 inhabitants.

The Swedish army, which in 1873 consisted of 150,773 men, has a special and peculiar organisation, as it consists principally of cantoned or quartered soldiers, who are maintained at the cost, and on the property, of the landed proprietors: each estate being mulcted according to its value or extent to maintain one or more men, and provide them with special dwellings, a certain portion of land, and a fixed rate of payment. In return, these reserve soldiers, who are for the most part married men, serve the proprietor as field-labourers in times of peace, except during the four weeks of each year in which they are called out for drill. In case of war they can be sent, with the companies in which they are enrolled, into active service, and they are then paid by the crown. The rest of the army is made up of volunteers, who serve for six years, every Swede between the age of 20 and 25 years being moreover bound to serve in the *bevaring* or National Guard. In addition to these corps, companies of volunteer free-shooters were created in 1861 for the general defence of the country, and placed under the command of officers appointed by the crown. The fleet consisted, in 1874, of 133 vessels of war, including 27 steamers and 96 sailing-vessels, carrying, in all, 455 cannons and 7743 men. In time of war a coasting merchant-fleet of 3200 vessels can be called into requisition, together with a reserve of 28,000 men. The principal fortresses are Carlsten, Gottenborg, Carlskrona, and Fredericksborg, 20 miles east of Stockholm. The military and other orders are the Seraphim, the Sword, the Northern Star, and the order of Vasa. The order of Charles XIII. embraces the highest rank of freemasons in Sweden.

S. is a hereditary and constitutional monarchy, based on the fundamental law of 1809, by which it was decreed that the succession should be in the male line; that the sovereign should profess the Lutheran faith; and that he should be assisted in the administration by a council of 10, consisting of 3 privy councillors, besides the ministers of justice, war, the marine, finance, religion, foreign affairs, and internal affairs. The diet, according to the amended regulations of Dec. 8, 1865, assembles every year, and votes the budget for the same period. It is composed of two chambers or estates, both elected by the people, but representing different interests. The first chamber, or upper house, consists of 127 members, or one deputy for over 30,000 people, chosen for 9 years, and selected from those who possess either landed property of taxed value of 80,000 rixdaler, or annual income of 4000 rixdaler. The second chamber, or lower house, consists of 188 members, elected for the towns and rural districts, 1 for every 10,000 of the former, and 1 for every 40,000 of the latter. The electors must be aged 21 years, and possess a small property or income. Committees of the two houses maintain a

watch over all constitutional questions, and have the power of calling upon ministers and other members of the government for explanations, and a constitutional committee has the power to indict the ministers and chief servants of the crown for mal-administration. The king has an absolute veto against any decrees of the diet, and possesses legislative power in matters of provincial administration and police.

The predominant form of religion in S. is the Lutheran, and the affairs of the church are administered by 1 archbishop (of Upsala) and 11 bishops, whose collective dioceses include about 2500 parishes, with about 3500 pastors. Although toleration is extended to all sects, none but Lutherans can hold the offices of the state, or receive employment in the public service; while the adoption of any other form of faith, by a member of the established Lutheran church, is followed by the loss of various burgher rights. Jews, Catholics, and members of other denominations number only a few thousands, and the only form of dissent that has acquired any important dimensions in S., in recent days, is that of the so-called Readers, who profess to have revived the primitive form of Lutheranism, and restrict themselves to the reading and individual interpretation of the Scriptures.

Education is universally diffused among the Swedes. Public instruction is compulsory for all children, and the cost is defrayed by the nation through national and ambulatory schools, which are well organised; many are trained at home in consequence of the national habit which prevails among the peasant and agricultural classes, of parents employing themselves, in the long winter nights, in teaching their children. The instruction of the burgher and higher classes is obtained at the universities of Upsala and Sund (the former of which was founded, in 1476, by Sten Sture, and the latter, in 1666, by Charles XI.), and at the numerous military, polytechnic, agricultural, and other special schools in Stockholm and Gottenborg, and other principal towns of Sweden.

History.—The legendary history of S. forms part of Scandinavian history. When we first hear of it, the country was inhabited by numerous tribes, kindred in origin, but politically separate. Two principal groups, however, are recognisable—*Goths* in the south, and *Swedes* in the north. These possessed in common a national sanctuary, the temple at Upsala, which laid the basis of a later unification, for gradually the royal chieftains of Upsala extirpated the inferior princes, the Härads and the Fylkis. Ingiald Hrada, the last ruler of the old royal family of the Ynglinger, who drew their origin from Niord, sought to establish a single government in Sweden, and perished in the attempt. To the Ynglinger followed in Upland the dynasty of the *Skioldunger*, which claimed to be descended from Skiold, son of Odin. Erich Edmundson, who belonged to this dynasty, is said to have acquired the sovereignty of the whole of Sweden about the end of the 9th century. The dawn of Swedish history (properly so called) now begins, and we find the Swedes constantly at war with their neighbours of Norway and Denmark, and busily engaged in piratical enterprises against the eastern shores of the Baltic. See NORMANS and RUSSIA. Efforts to introduce Christianity (see ANSGAR) were made as early as 829 A.D., but it was not till 1000 A.D. that Olaf Schooszkönig was baptised, nor did the struggle between heathenism and the new religion cease till the burning of the temple of Upsala, in the reign of Ingiald (1080—1112). In 1155, Eric, surnamed the Saint, gave a powerful impetus to the diffusion of Christian doctrines, by building churches and founding monasteries. He undertook a crusade against the pagan Finns, and having compelled them to submit to baptism, and established Swedish settlements among them, he laid the foundation of the closer union of Finland with Sweden. Eric's defeat and murder, in 1161, by the ambitious young Danish prince, Magnus Henriksen, who had made an unprovoked attack upon the Swedish king, was the beginning of a long series of troubles, and during the following 200 years, one short and stormy reign was brought to a violent end by murder or civil war, only to be succeeded by another equally short and disturbed; until, at length, the throne was offered by the Swedish nobles to Margaret, Queen of Denmark and Norway, who, having gladly availed herself of the opportunity thus opened to her of uniting the three Scandinavian crowns into one, threw an army into S.; defeated the Swedish king, Albert of Mecklenburg, who, on the deposition of his maternal uncle, Magnus, had been called to the vacant throne; and by the union of Calmar, in 1397, brought S. under one joint sceptre with Denmark and Norway. In 1523, S. emancipated itself from the union with Denmark, which, during the reigns of Hans and his son Christian II. (see DENMARK), had become hateful to the Swedes, and rewarded its deliverer, the young Gustaf Vasa (q. v.), by electing him king, and declaring its independence of Denmark. Gustaf Vasa found an empty treasury, a kingdom exhausted by war, a haughty nobility and clergy (who arrogated the right of electing the sovereign, and who claimed exemption from all imposts), and a people overburdened with taxation and bad government, and divided in regard to religion; yet on his death, in 1560, he left to his successor a hereditary and well-organised kingdom (in which the power of the nobles had been circumscribed, and that of the clergy broken, by the abrogation of Catholicism, and the firm establishment of the Reformed Church under the jurisdiction of the state), a full exchequer, a standing army, and a well-appointed navy. Trade, manufactures, arts, learning, and science, owed their advancement in S. to this patriotic king.

The colossal labours of the great Vasa in raising a semi-barbarous state to an honourable place among the civilised monarchies of Europe, were rendered almost useless by the crimes and misfortunes of his son and successor, Eric XIV., whose high intellectual powers were clouded by a wayward and revengeful nature, leading him finally to insanity. His cruelties and excesses led to his deposition in 1568, when his younger brother John ascended the throne, which he occupied for nearly a quarter of a century, dying in 1592, after a stormy reign, stained by the cruel murder of his unfortunate brother Eric, and distracted by the internal dissensions arising from his attempts to force Catholicism on the people, and the disastrous wars with the Danes, Poles, and Russians. John's son and successor, Sigismund, who had been elected king of Poland through the influence of the relatives of his Polish mother, after a short and stormy reign of eight years, which were spent in attempting to restore Catholicism in S., was compelled by the diet to resign the throne to his uncle Charles, the only one of Gustav Vasa's sons who inherited any share of his legislative and administrative talents. The policy of Charles IX. was to encourage the burgher classes at the expense of the nobility, and by his successful efforts to foster trade—in furtherance of which he laid the foundation of Gottenborg and other trading ports—develop the mineral resources of the country, and reorganise the system of Swedish jurisprudence, he did much to retrieve the calamitous errors of his predecessors. The deposition of Sigismund gave rise to the Swedo-Polish war of succession, which continued from 1604 to 1660; and on the death of

Charles in 1611, his son and successor, the great Gustavus Adolphus, found himself involved in hostilities with Russia, Poland, and Denmark. By the ability of his minister, Oxenstierna, the young king was soon enabled to conclude treaties of peace with his northern neighbours, and to place the internal affairs of his kingdom in order (see GUSTAVUS II.); and although he justly ranks as one of the greatest military commanders of his age, the extraordinary number of benefits which he conferred on every department of the administrative system of S., entitle him to still greater renown as the benefactor of his native country. His death in 1632, on the field of Lützen, would have proved an irreparable calamity to S., had not the able administration of Oxenstierna, during the minority of Gustavus's daughter Christina, maintained the renown of the Swedish arms abroad, and the political reputation of the country among other states. The reign of Christina (q. v.) was a futility, and the most popular of her acts was her abdication. The short reign of Charles X. was occupied in generally unsuccessful wars against Poland and Denmark; while the minority and long rule of his son, Charles XI. —from 1660 to 1697—was characterised by success abroad, and in the augmentation of the regal power, which was declared by an act of the diet to be absolute. His son, Charles XII. (q. v.), succeeded, at the age of 15, to the power and dominions which his father's abilities had consolidated, but which, notwithstanding his own brilliant genius, he so deeply imperilled by his insatiable ambition, that at his untimely death in 1718, at the siege of Frederikshald, after a brilliant career of glorious but chequered military achievements, he left his country overwhelmed with debts, and disorganised by prolonged misrule. With him the male line of the Vasas expired, and his sister and her husband, Frederick of Hesse-Cassel, were called to the throne by election, but were the mere puppets of the nobles, whose rivalries and party dissensions plunged the country into calamitous wars and almost equally disastrous treaties of peace, and, under the leadership of the two great factions of the 'Hats,' or French party, and the 'Caps,' or Russian party, demoralised all ranks of society. The weak Adolphus Frederick of Holstein-Gottorp, who was called to the throne on the death of Frederick in 1751, and died in 1771, did little to retrieve the evil fortunes of the state; but his son, Gustavus III (q. v.) (1771—1792), skilfully turned to account the general dissatisfaction of the people with the nobles, to destroy the factions of the Hats and Caps, and to recover the lost power of the crown. His extravagance, dissoluteness, and insincerity detracted, however, from his merits as a ruler, and raised up numerous enemies against him, through whose agency he was assassinated in 1792. His son and successor, Gustavus IV. (q. v.), lacked the ability to cope with the difficulties of the times, and after suffering in turn for his alliance with France, England, and Russia, was forcibly deposed in 1809, and obliged to renounce for himself and his direct heirs the crown in favour of his uncle, Charles XIII., who saw himself compelled at once to conclude a humiliating peace with Russia by the cession of nearly a fourth part of the Swedish territories, with $1\frac{1}{4}$ million of inhabitants. The early part of the reign of Charles, who was childless, was troubled by domestic and foreign intrigues to regulate the choice of an heir to the throne; and when, under the erroneous idea of conciliating Napoleon, the dominant party in S. elected General Bernadotte to the rank of Crown Prince, the latter assumed the reins of government, and by his steady support of the allies against the French emperor, secured to S. at the congress of Vienna, the possession of Norway, when that country was separated from Denmark. Under the able administration of Bernadotte, who, in 1818, succeeded to the throne as Charles XIV., the united kingdoms of S. and Norway made great advances in material prosperity and political and intellectual progress; and although the nation at large entertained very little personal regard for their alien sovereign, his son and successor, Oscar (1844—1859), and his grandsons, the late king, Charles XV., and the present king, Oscar II., who came to the throne in 1872, have so identified themselves with their subjects that the Bernadotte dynasty has secured the loyal affections of every section of the united nations of S. and Norway.

SWEDENBORG, EMANUEL, a man of science, a philosopher, a theologian, and a seer, was born in Stockholm, Sweden, January 29, 1688, and died in London, March 29, 1772. His father, Jesper Svedberg, was a bishop of the established church of Sweden, whose family was ennobled by Queen Ulrika Eleonora, and the name changed from Svedberg to Swedenborg. This gave E. S. the rank of a nobleman. He was educated at the University of Upsala, where he graduated at the age of twenty-one. He then traveled for four years in England, Holland, France, and Germany. He had an ardent love for mathematics and mechanics, in which branches he was especially proficient. On his return to Sweden he was appointed by Charles XII. to an assessorship in the College of Mines. He enjoyed the intimate friendship of that monarch, to whom he rendered important services at the siege of Fredericks-hall, by transporting vessels over land on carriages of his own construction. At this period his mind was busy with various scientific subjects, upon which he published pamphlets from time to time, such as short treatises on algebra, giving the first account in Sweden of the differential and integral calculus; on a mode of finding the longitude at sea by the moon; on decimal money and measures; on the motion and position of the earth and planets; on docks, canals, salt-works, chemistry, bridges, air-guns, submarine vessels, the circulation of the blood, a new system of notation, and many other subjects. In 1724 he was offered the Professorship of mathematics at Upsala, which he declined. He now remained silent for eleven years; but the result appeared at Leipsic in 1734, in three massive folios beautifully illustrated, entitled *Opera Philosophica et Mineralia.* The first volume, called *Principia, or the First Principles of Natural Things, being new attempts towards a Philosophical Explanation of the Elementary World,* is an elaborate deduction of matter from 'points of pure motion produced immediately from the Infinite.' This was followed in 1734 by a treatise on *The Infinite, and the Final Cause of Creation.* The other two volumes describe the manufacture of copper, iron, and brass, and contain an exhaustive record of the best methods in use in last century. His investigations at this period were pursued with the expressed determination to discover the soul itself, and indeed to penetrate the whole realm of final causes. With this end he studied Anatomy and Physiology, and thereupon published in 1741 two volumes entitled *Œconomia Regni Animalis*, and in 1744—5 three volumes entitled *Regnum Animale.* The character, number, and variety of these works serve to shew the character, attainments, and purposes of the man, and to render still more striking his subsequent career.

Suddenly his scientific labors ceased, and in all his works afterwards published, he scarcely so much as alluded to them. He soon resigned his assessorship, and devoted himself exclusively to the labor which has since rendered him so celebrated. To give the substance of his own account of this transition, the

Lord appeared to him in an unexpected manner by the opening of his spiritual senses, and commissioned him to be the herald of a New Dispensation, or of the New Church signified by the New Jerusalem in the Revelation. As such, his office was to interpret the Word of God according to its true significance; to set forth a complete system of true religious doctrine; and finally, by daily intercourse for twenty-seven years with the spiritual world, to reveal its nature, its order, and the constant relation of all men to it. The result of all this was, the publication in Latin of a series of theological works, more voluminous than even his previous scientific productions. The first and largest is called, *Arcana Cœlestia; the Heavenly Mysteries contained in the Holy Scripture, or Word of the Lord, unfolded in an Exposition of Genesis and Exodus: together with a Relation of Wonderful Things seen in the World of Spirits, and in the Heaven of Angels*, 12 vols., published in London during 1749–56. Next came a volume entitled *Heaven and Hell, a Relation of Things heard and seen.* To these succeeded others, of which the following are abbreviated titles: *Earths in the Universe, with an Account of their Inhabitants: The Last Judgment: The New Jerusalem and its Heavenly Doctrine: The White Horse of the Apocalypse: Doctrine of the New Jerusalem respecting the Lord:* and similar treatises on *The Sacred Scripture*, on *Life*, and on *Faith: Divine Love and Wisdom: Divine Providence: Apocalypse Revealed* (2 vols.): *Conjugial Love: Intercourse between Soul and Body: True Christian Religion.* His posthumous works are *Apocalypse Explained* (6 vols.): and other smaller ones. These books leave scarcely a point in theology, or even any important subject of human thought, untouched or unaltered. According to their general tenor, God is the only, and the original Substance and Form—this Substance being Love, and its Form, Wisdom; together they emit a creative and preservative Sphere (which appears in the spiritual world like a Sun), that operates forever upon all beings and things. And thus we have an abstract expression of the Divine Trinity—Love, Wisdom, Use—the three being inseparably one, each essential to the others and yet perfectly distinct. They involve the Doctrine of Degrees; for each is graduated from centre to circumference as light declines to shade; this is the Continuous Degree, or Continuous Gradation: again, one is evolved in order from the other, and envelops the other, like end, cause, and effect; yet love is not wisdom, neither is wisdom use; this exhibits the Discrete Degree, or Distinct Gradation. This trinal and graded structure of things is universal, *in maximis et minimis.* There are consequently three heavens; in the highest, love predominates; in the second, wisdom; in the third, use: and three hells; in the deepest, self-love predominates; in the second, self-derived wisdom; in the third, self-service. Every man is created in the same order; he is love, wisdom, and their use (or their active operation in producing effects), a spiritual organism, clad with a material body, which he puts off at death, and never resumes again,—thereby entering that heaven or hell with which his character is homogeneous. The soul is the real man.—Less abstractly, God is the Infinite Man, the Soul of all souls, the Prototype. He is Life itself. Love is Life. He assumed Humanity in Christ, in whom His Love is the Father, His Wisdom the Son, and their proceeding sphere the Holy Spirit. Christ is therefore the Triune God. The trinity of Persons is an error. Because God is the Infinite Man, every man is a man, every angel (all angels were first created men), every devil, every society of either, and all heaven, or all hell, in the aggregate, is in organization a man. But hell is deformed, and heaven beautiful. Finally, for the same reason, the outer universe is representative of man. 'Like begets like. All beings and things are receptacles of the influent Divine Life, and receptacles only; they have life and being only by a constant interior communication from God. Man's individuality and freedom are from the same source. 'Existence is perpetual subsistence.' 'Preservation is perpetual creation.' God made man innocent. Appearances, by appealing to his lower and sensual faculties, beguiled him from the love and knowledge of God, and the race gradually became wicked. This is the Fall. After death wicked men formed infernal societies. This is the origin of hell, which is called the devil. There is no other devil. Hell thus enlarged itself; and heaven, consisting of associations of the good, grew relatively weak. God then assumed Humanity to reach hell in externals, where its power was fixed. By a life of wonderful inward significance, wherein he overcame all possible temptations, He subdued hell, restored heaven to order, re-established the Church, drew nearer to men on earth, and thus wrought redemption, which is essentially man's deliverance from evil, by giving him communication with God. Since the fall, man naturally tends to self-love, the synonym of evil; he must therefore be reformed and regenerated. He is reformed by learning what is good and true, and acting accordingly in opposition to his evil tendencies. Into this improved mode of thought and action on man's part, the Divine Love and Wisdom can freely flow, and vivify him with all good affections, and enlighten him with wisdom. This is regeneration. The regenerate form heaven. All infants also go to heaven, and are tenderly reared by the angels. They grow up to angelic manhood and womanhood. The origin of sex is in the soul. Therefore in heaven they live in marriage with indescribable happiness. Promiscuity prevails in hell, which in all respects is the exact opposite of heaven, as falsehood is of truth, or evil of goodness. Heaven and hell are eternal, and counterbalance each other. Between them is an intermediate state, upon which all enter at first after death, staying long enough to put off all that does not belong to their life's love, and then going, in accordance with this love, to their own, in heaven or in hell. God does not hate and torment hell. He is Love, and cannot. He loves all equally, and gives Himself to all alike; but all do not receive Him alike. He makes heaven blissful by His presence, and ameliorates the condition of hell by a superintendent mercy and restraint. The sufferings of hell are the legitimate effects of its intense lusts and selfishness. The spiritual world is not far off. It is simply the world of spirit, where all spirit always is. To enter it is to have the spiritual senses opened, as happens sometimes in life, and always at death. Time and space belong not to it, but to Nature. Spiritual time and space are internal states of wisdom and love; but they are to the spirit precisely what natural time and space are to the body. The two worlds communicate by correspondence only. Thus heat and light correspond to love and wisdom, which are spiritual heat and light; and everything in either world is similarly correspondent to something in the other. The universe is thus all representative, and full of sublime significance. The Sun is representative of the Lord; the earth of man; and so on. The Word is written by correspondences, a knowledge of which S. was called to restore; it therefore connects heaven and earth, God and man, and contains a spiritual and a celestial sense within that of the letter.

These and other general statements are wrought out in S. with great variety and copious illustration. To this work he confined himself, making no effort to organize a church on the basis of the

new doctrines. Personally, he was modest and retiring, but genial and happy, and lived a life of extreme simplicity. He was never married. Since his death, organizations of those who believe his theological writings to be the Lord's Second Coming as spiritual Truth unfolded from the Word of God, have been formed both in England and America, the majority of which societies are again united in general bodies, known in England as the General Conference, and in America as the General Convention, of the New Church. There are other societies and individuals holding the same views not connected with these bodies. S.'s writings are also esteemed of the highest value by many who accord to him no special authority. All together are not numerous, but they include in their ranks much worth and intelligence, and many noted names both in Europe and America.

Several biographies of him have been written, among which the most widely-known are those of Wilkinson, White, and Hobart. Societies have been formed at different times, both in England and America, for the publication of his theological works, and one of these also published the more important of his scientific works in a very fine translation. Many of the former works have also been translated into French and German, and are now being translated in Norway and Sweden. A new edition of them, in a new translation, and in very handsome style, is now in the course of publication by J. B. Lippincott & Co., of Philadelphia. This edition is designed to be complete, and will comprise about forty volumes *demi-octavo*.

SWEDISH LANGUAGE AND LITERATURE. See SCANDINAVIAN LANGUAGE AND LITERATURE.

SWEEPS, on Shipboard, are oars of great length used in large vessels during a calm, to enable the ship to obtain steerage-way.

SWEET BAY. See BAY.

SWEET BRIER. See ROSE.

SWEET FLAG. See ACORUS.

SWEET GUM. See LIQUIDAMBAR.

SWEET-MEAT, a general term applied to such articles of food as consist chiefly of sugar. An almost infinite variety of preparations of the confectioner come under this term.

SWEET PEA. See LATHYRUS.

SWEET POTATO. See BATATAS.

SWEETS, a term applied in England, and by the Board of Inland Revenue, to home-made wines, for the sale of which a special license is granted. It is also a term in far more general use for lozenges, comfits, and other preparations of sugar well known to children; they are the *confitures* of the French.

SWEET SOP (*Anona squamosa*), a fruit of the same genus with the Custard Apple (q. v.). It is produced by a small bush, with lanceolate leaves, a native of the warm parts of America, and much cultivated in Brazil, the West Indies, and generally in tropical countries. The fruit is greenish, and resembles an artichoke in size, in form, and in its scaly covering. The pulp is soft, somewhat mealy, sweet, and luscious; with a musky aromatic odour and flavour. It is much used both in the East and West Indies, generally raw, but sometimes cooked. Notwithstanding its foreign origin, it has proved the staff of life to the people of Hindustan in seasons of famine. The seeds are acrid, and the powder of them is used to destroy insect vermin.

SWEET WILLIAM. See PINK.

SWEET WOOD. See CASCARILLA.

SWELL, in Music, a set of pipes in an organ with a separate key-board, and forming a separate department, which are capable of being increased or diminished in intensity of sound, by the action of a pedal on a series of shades or shutters overlapping each other like Venetian window-blinds, within which the pipes in question are enclosed. On a well-constructed swell, a practised performer can imitate not only a gradual *crescendo* and *diminuendo*, but also a *sforzando*, a very small opening sufficing to make an immediate burst on the ear; while, when the shutters are closed, an imitation of an echo is produced.

SWIETE'NIA. See MAHOGANY.

SWIFT (*Cypselidæ*), a family of birds of the division *Clamatores*. The distinctive characters of the group, of which the true Swifts are the type, are noticed in the article SWALLOW. The swifts, like the swallows, are widely distributed, and some are only found in tropical countries; others are birds of passage, and spend the summer in colder parts of the world. Many of the S. group are often popularly called swallows, as that which produces the edible nests of the East Indies. In the genus *Cypselus*, as now restricted, the tail is generally forked, the legs and toes feathered, and very small and weak, all the four toes directed forwards. The birds of this genus pass most of their time in the air, and even copulate on the wing. The wings are longer than in any other bird; and the internal structure, even of the skeleton, is peculiarly adapted to prolonged flight. The anatomy more resembles

Common Swift (*Cypselus apus*).

that of humming-birds than of true swallows.—The COMMON S. (*C. apus*) is common in almost all parts of the north of Europe and of Asia in summer, retiring to tropical or subtropical regions in winter. It occurs even in Lapland. Its residence in its summer quarters is much shorter than that of swallows; and it is worthy of notice, that the S. is seldom to be seen along with any of the swallows or martins, the different kinds choosing different localities, even although very close together. The S. is easily recognised in its flight by the remarkably sickle-shaped wings, and its slight scream is very different from the twitter of the swallow. It is black, with a white throat. It makes its nest in holes of rocks or of walls, often in those of houses. The nest is formed of bits of straw, dry blades of grass, and bents, feathers, and other such substances, which are apparently glued together by a mucous secretion. The S. sometimes builds in hollow trees. Swifts, like swallows, seem to return to the same

place to make their nest, year after year, and repair the old nest, instead of making a new one.—The ALPINE S., or WHITE-BELLIED S. (*C. alpinus*), is rarely seen in Britain, but is common in the more southern countries of Europe. It builds in high rocks, sometimes in steeples. It is larger than the Common S., and is the largest of the British *Hirundinidæ*. Its wings are even longer in proportion than those of the Common Swift. Its voice is sweet, not a scream like that of the Common Swift. —The AMERICAN S. (*Chætura pelasgia*) has the hind-toe directed backwards, and the tail-feathers stiff and pointed, as in woodpeckers. It is a small bird, not above 4¾ inches in entire length, but 1 foot in extent of wing. The general colour is brownish black, with greenish reflections, the throat grayish white, the under parts grayish brown. The nest is made of small dry twigs, which the bird breaks off from the tree, and carries away in its feet; and they are attached by means of the saliva, to the rock, wall, or hollow tree where the nest is made. From its frequently building in chimneys, this species is known as the *Chimney Swallow* in North America. Great numbers often build together, sometimes choosing for this purpose an unused chimney in a town.

SWIFT, JONATHAN, the greatest of English satirists, and the most original writer of his age, was born in Dublin, but of English parents, on the 30th of November 1667. He was a posthumous child, reared amidst circumstances of abject poverty and dependence, the recollection of which galled his proud irascible spirit, and embittered much of his future existence. He was supported by relatives, and educated at Kilkenny school and Trinity College, Dublin. He proved a negligent and turbulent student, more intent on personal satires and political rhymes than academical honours; but he remained at college about seven years. He then removed to England, visited his mother in Leicestershire, and by her recommendation was admitted into the house of Sir William Temple, who had long known the Swift family. He seems at first not to have conciliated the regard of the retired minister, for in the following year (May 1690), Temple made an offer of the services of his protégé to Sir Robert Southwell (then about to proceed to Ireland as Secretary of State), recommending him as diligent and honest, qualified either to wait on Sir Robert as a gentleman, or to write under him as a clerk. No appointment followed; S. remained with Temple, studying hard, till 1694, when he went to Ireland, took orders in the church, and obtained a small living, which he threw up in two years, and returned to England, in consequence of Temple, who missed his society and assistance, urging him to come back. Temple died in 1698, and S. in the following year, published his posthumous works, after which he again repaired to Ireland, obtaining from Lord Berkeley some church preferments, including the vicarage of Laracor, worth in all about £400 per annum, which was all the professional income he enjoyed till he was appointed Dean of St Patrick's, in his 46th year. Before this, he had written the wildest and wittiest and most powerful satirical work of the 18th c., *The Tale of a Tub* (1704), also a few essays on ecclesiastical subjects, some inimitable ridicule of astrology under the name of Isaac Bickerstaff, and poetical pieces possessing a peculiar vein of humour and description. In 1710, he went over to the Tories, conceiving himself neglected by the Whig ministers, and exerted himself strenuously in behalf of his new allies, Harley and Bolingbroke. He wrote papers in *The Examiner* (1710); a *Letter to the October Club* (1711); *The Conduct of the Allies* (1712); *The Barrier Treaty* (1712), and innumerable pasquinades against the Whigs, whom he 'libelled all round.' He had become, as it were, a great and formidable power in the state, yet could extort no higher preferment for himself than the deanery of St Patrick's. His party was overthrown by the death of Queen Anne; and in 1714, S. 'commenced Irishman for life,' with strong reluctance and disgust. In time, however, he took interest in Irish affairs, and identified himself with Irish feelings and prejudices. Hatred to Walpole and the English government quickened his activity; and his resistance to Wood's copper coinage—a scheme for supplying Ireland with copper money by an English patentee—raised him to the highest pinnacle of popular favour. His *Drapier Letters* (1724) produced quite a ferment in Ireland, and compelled the government to abandon the scheme of the coinage. Two rewards of £300 each had been offered for the unmasking of the Drapier, but not a traitor, as he says, could be found to sell him. The triumphant author made his last visit to England in 1726, and published his *Gulliver's Travels*, the most universally popular of all his works. He next joined with Pope, Arbuthnot, and Gay in publishing three volumes of *Miscellanies*, after which he returned to Ireland (October 1727), and never left it again. He was subject to fits of giddiness and deafness, which increased in frequency and intensity as he grew old; he brooded over the anticipated madness which he foreboded would be his future lot; his temper, always irritable and gloomy, became more violent and morose, the effect of cerebral disease, and his memory and other faculties gave way. There was also a deep and secret grief: the fate of two ladies, known as Stella and Vanessa, had been inseparably entwined with his own destiny; both had sacrificed for him all but honour, and had sunk under disappointed hopes and blighted affection. We cannot here trace the painful story, which is still involved in mystery, but for a time the retribution of S. was terrible. He rallied, however, and wrote some of his best minor pieces after this period. Among these are *The Grand Question Debated; On Poetry, a Rhapsody; The Legion Club; Verses on the Death of Dr Swift;* and that extraordinary prose tract, *The Modest Proposal*, a masterpiece of irony, in which he proposes to relieve the distresses of the poor Irish by converting their children into food for the rich. The last three years of S.'s life were passed in almost total silence in the hands of keepers. He died October 19, 1745.

It would be superfluous to attempt in our brief space to characterise the genius of the immortal Dean of St Patrick's. Shakspeare alone among English authors has received a greater amount of criticism and annotation. From Johnson to Thackeray, the most brilliant critics and biographers have employed themselves in elucidating his strange and sad history, and in estimating his writings. As a consummate master of ridicule and irony, possessing great powers of wit, invention, illustration, and analogy; possessing also the dramatic faculty that enabled him to assume and portray varieties of character; and as writing a pure, perspicuous English style, unsurpassed for strength and simplicity, S. must ever be a model in our language and literature. His misanthropy, or degradation of human nature—his Yahoos, Strulbrugs, daring irreverence, and indelicacy, are of course indefensible. He had a total incapacity, as De Quincey remarks, for 'dealing with the grandeurs of the human spirit, with religion, with poetry, or even with science, when it rose above the mercenary practical.' His business was with the world—with the follies, vices, and absurdities of men. And his poetry is the same as

his prose; it may come under his definition of a good style, 'proper words in proper places,' applied to ordinary topics, but is wholly wanting in passion, elevated feeling, and imagination. A complete edition of his works (with a biography), in 19 vols., was published by Sir Walter Scott (1815). See also Roscoe's edition (2 vols. 1853).

SWI'LLY, Lough, an inlet of the Atlantic on the north coast of Ireland, in the county of Donegal, enters between Dunaff Head on the east, and Fanad Point, on which there is a light-house, on the west. It penetrates the country in an irregular, but generally south direction, is about 25 miles in length, and at its entrance, where it is widest, it is 3¾ miles broad. On the eastern shore is the small town of Buncrana, which is resorted to by considerable numbers for sea-bathing; and in front of which is a commodious roadstead, capable of accommodating the largest men-of-war.

SWIMMING. The art of swimming is so exceedingly useful, not only as a bracing summer exercise, but as a means of preserving life, that it should be acquired by every young person. Considering the numerous risks run by all human beings, especially by the inhabitants of maritime countries, of being accidentally plunged into the water; and how greatly the chances of being saved are increased by the power of keeping one's self afloat for even five minutes, it is surprising that the art of swimming does not form an essential element of education among all classes. With our limited space, it would be needless to attempt giving directions that would be of any practical value. In many cities, there are now swimming-schools, where professional instruction may be had. When these are not available, any acquaintance who can swim will give his aid until the elementary movements and the necessary confidence are acquired. Even without assistance, by keeping in safe water, and by determined perseverance, the art will be acquired as by instinct. The principles of the art will be found explained in Chambers's *Information for the People*—'Out-of-door Amusements.' See also Routledge's *Handbook of Swimming and Skating*; and *The Boy's Own Book*.

SWI'NDON, an old market-town of Wilts, 77 miles west of London by the Great Western Railway. It contains a handsome church, large corn exchange, and excellent shops. About a mile north of the town is Swindon Junction, the great central establishment and manufactory of the Great Western Railway Company. The engine dépôt here is capable of accommodating 100 engines, and a number of engines and tenders are always kept ready for action, for here every train changes its locomotive. A considerable town has risen around the station, called the New Town, and consisting for the most part of dwellings for the employés of the railway. There are also a large and remarkably beautiful church, a public park, library, and mechanics' institution. Pop. of Old Town (1881), 4696; of New Town, 17,669.

SWI'NEMUNDÉ, a maritime and fortified town of Prussia, province of Pomerania, is situated on the island of Usedom, at the entrance of the narrow channel of Swine, which connects the Grosse Haff (into which the Oder flows) with the Baltic. S., as in some sense the port of Stettin (q. v.), carries on a considerable commerce, and has also valuable fisheries, but it is chiefly noted for its excellence as a bathing-place, being, next to Dobberan, the most frequented town in this respect on the Baltic. Its agreeableness as a sea-coast residence is enhanced by the beauty of the environs. S. has regular steam-communication with Stettin (daily), Rügen, and Copenhagen. The population of this port is said to be about 10,000.

SWING, a cognomen assumed by senders of threatening letters during the period when the irritation of the agricultural labourers of England against their employers was at its height—viz., from 1830 to 1833. The cause of this misunderstanding arose from a widespread belief on the part of the labourers, that the use of machinery, especially of thrashing-mills, would greatly lessen the demand for labour, and consequently produce a general reduction of wages; it was also intensified by the savage severity with which the game-laws were enforced, and by other hardships to which the labouring-classes in the country considered themselves unjustly subjected. The ordinary mode of procedure by these terrorists was to send a letter to the obnoxious farmer or landlord, complaining of his conduct, and demanding the adoption, without delay, of a more liberal course towards his workmen—either by raising their wages, giving up the use of his thrashing-machine, &c., as the case might be—and, in default of compliance, threatening destruction to his property—a threat which was in general amply executed. For months together, the destruction by fire of stacks, farm-buildings and machines, and live-stock, was of nightly occurrence; and so terrified did the employers of labour soon become, that implicit obedience was paid to the dictates of 'Captain Swing;' many even who had not been favoured with a notice from this unseen 'reformer,' hasted to profit by the sad experience of a neighbour, and avert the wrath of the inevitable avenger from their own heads by at once raising the scale of wages. It is not to be wondered at that with such encouragement 'Swings' became numerous, and their demands more insolent; but the apprehension and punishment of a number of them gradually brought about a cessation of the outrages. It was a current belief at the time that they were due to the agency of secret revolutionary agents; but it subsequently appeared that in the great majority of cases no such incitements had been employed.

SWITHIN, Saint, an English ecclesiastic of the 9th c., who was chaplain to King Egbert, and tutor to his son Ethelwulf, under whom, when he came to the throne, he held the office of Chancellor. He had the charge of the education of King Alfred, whom he accompanied to Rome. In 852, he was consecrated Bishop of Winchester. According to William of Malmesbury, he was 'a rich treasure of all virtues, and those in which he took most delight were humility and charity to the poor.' He adds, that he built several churches, and travelled through his diocese with his clergy on foot, and for the most part by night, in order to avoid the appearance of ostentation. The origin of the tribute called 'Peter-pence' (q. v.) has been often assigned to S., and he is said to have procured an act of the Wittenagemote, enforcing, for the first time, the universal obligation of paying tithes. S. died on 2d July 862, and was buried, according to his own desire, in the church-yard of Winchester. A century later, he was canonised; and the monks, not considering this a fitting place of sepulture for a saint, exhumed his body, for the purpose of depositing it in Winchester cathedral; but this translation, which was to have taken place on the 15th July, was delayed in consequence of violent rains, which continued without intermission for forty days. Out of this circumstance arose the still current belief, that if rain fall on the 15th July, it will continue to rain for forty days. Experience certainly shews, that when a period of wet weather sets in about the summer

solstice, it generally proves of considerable duration; and we find a similar superstition popularly attached in different countries of Europe to the festivals of various saints, which occur about the same period of the year. In France, the watery saints' days are those of St Médard (8th June), and St Gervais and St Protais (19th June), the meteorological canon being—

> S'il pleut le jour de Saint Médard,
> Il pleut quarante jours plus tard;
> S'il pleut le jour de St Gervais et de St Protais,
> Il pleut quarante jours après.

The rainy saint in Flanders is St Godelieve, and in Germany there are three saints' days to which this belief attaches, one being that of the Seven Sleepers.

SWITZERLAND (Ger. *Schweitz;* Fr. *Suisse;* It. *Svizzera*) is an inland country of Europe, situated between 45° 48′—47° 49′ N. lat., and 5° 55′—10° 30′ E. long. Its greatest length from east to west is 180 miles, and its greatest width from north to south, 130 miles. Its superficial area is 15,721 square miles, or one-fourth that of England and Wales. The following table shews the area and population (according to the census taken December 1, 1880) of the cantons into which Switzerland is divided:

Cantons.	Area in Eng. Square Miles.	Pop. Dec. 1880.
Zürich	659	317,576
Bern	2,615	532,164
Lucerne	480	134,806
Uri	418	23,694
Schwyz	358	51,235
Unterwalden {Upper and Lower}	298	27,348
Glarus	265	34,213
Zug	91	22,994
Freiburg	632	115,400
Soleure	292	80,424
Basel {Town and District}	181	124,372
Schaffhausen	118	38,348
Appenzell {Exterior and Interior}	163	66,799
St Gall	781	210,401
Grisons	2,706	94,991
Aargau	538	198,645
Thurgau	384	99,552
Tessin, or Ticino	1,082	130,777
Vaud	1,226	238,730
Valais	2,016	100,216
Neufchatel	308	103,732
Geneva	110	101,595
Total	15,721	2,846,102

Surface.—S. is the most mountainous country of Europe. Its principal chains are the Alps (q. v.) and the Jura (q. v.). The former run from east to west along its southern or Italian frontier. Their ramifications fill more than one-half of the country, and terminate along a line which may be traced from Vevey, on the Lake of Geneva, to Mount Moleson and Mount Napf, across Lake Zug, to the southern shores of the lakes of Zürich and Wallenstadt, and Sargans on the Rhine. The mean elevation of the highest chain is from 8000 to 9000 feet. The Jura run north-east from the western corner of Switzerland. They consist of a series of parallel ridges enclosing long and narrow valleys, and their mean elevation does not exceed 4000 feet. In the angle formed between them and the Alps, lies the plain of S., a tableland 100 miles in length, and from 20 to 30 miles in width, with a mean elevation of about 1400 feet above the sea. It is not absolutely level, but covered with elevations, which seem very unimportant, however, when contrasted with the huge masses of the Alps and Jura. It has been described, and not inaptly, as a corner of Southern Germany, penetrating like a wedge between France and Italy. The communication between the plain of S. and the German valleys of the Danube and Rhine is not, however, continuous. The plain on the east terminates in a third hilly tract—the Thur hill-country, which lies between the lakes of Zürich and Constance, and which, to some extent at least, forms a barrier between the plain of S. and Germany. The Jura, the plain, and the hill-country are, then, the great divisions of Northern Switzerland. The divisions of the Alpine region are more strongly marked in nature. A glance at the map will shew that the chains which overspread it radiate from a mountain knot lying to the west of the Grimsel Pass. They isolate and enclose (1) the valleys drained by the Rhone, which connect S. with Southern France; (2) Ticino, drained by streams which descend to the Po, and have at all times brought this country into close communication with Italy; (3) The Grisons, the most sequestered valleys of Switzerland, drained by the tributaries of the Rhine and Danube, and shut out by mountains from the lower basins of these rivers; (4) The Bernese Oberland, which slopes towards the western extremity of the Swiss plain; (5) The district of the Forest Cantons—Schwyz, Uri, and Unterwalden—surrounding the Lake of Lucerne, and which slope towards the eastern extremity of the plain, and seem a great mountain fortress erected in the very heart of Switzerland, to protect the plain against German invasion.

Geology is of little importance in explaining the general geography of Switzerland. It may, however, be stated that in the Southern Alpine region, the rocks are crystalline; that in the Northern Alpine region, they belong to the Jurassic and other Upper Secondary strata; and that in the plain and a great part of the hill-country, they consist of loose Tertiary sands and clays, which supply the best agricultural soils of Switzerland. Those rocks and formations in which mines and coal chiefly abound are absent.

Climate.—In S., the climate chiefly varies with elevation above the sea-level. At a height exceeding 9500 feet, the mountains are covered with perpetual snow, which descends along the hollows in Glaciers (q. v.) to a much lower level, and in this way covers the elevated part of the country with a vast sea of ice. Below the level of perpetual snow, the surface of S. has been divided into a series of belts, characterised by different climates and productions. The highest of these, lying between the snow and the level of 6900 feet has been called the Upper Alpine region. In it the glaciers fill the valleys, but plants clothe the scanty soil of the ridges. The second or Lower Alpine belt descends to 4800 feet. It is a country of pastures, in which shrubs but no trees make their appearance. The Righi Pass, the Grimsel Hospice, and the Splügen are included in it. The third belt descends to 4350 feet. The meadows still abound in it, but forests of firs and maples in many parts replace them. It includes Urfenthal and Oberengadin. The fourth belt sinks to 3000 feet. The forests still abound, the beech being the prevailing tree. The meadows are excellent, and rye and barley are successfully cultivated. It includes Weissenstein, Grindelwald, and Engelsberg. The fifth belt lies above 1800 feet. In it the oak and walnut are the characteristic forest trees. Spelt and the best wheat are cultivated. It includes Bern, Coire, and St Gall. The last belt sinks to 750 feet. In it the chestnut is the characteristic tree; the mulberry and the vine are extensively cultivated, and wheat is the grain chiefly grown. This belt includes the

greater part of the Swiss plain, and sinks to its lowest level in the Valley of the Rhine, between Constance and Basel, and the banks of Lake Zürich and the Lago Maggiore. In the last district, the vegetation is that of Northern Italy. At a higher elevation than 6400 feet, S. is only inhabited by herdsmen during the summer months. At this limit, however, permanent abodes begin to make their appearance; and at 4000 feet there are many villages. The most populous part of S., however, lies between 1250 and 2150 feet. The temperature of this region is fairly represented by that of Zürich, which we will compare with that of London. The temperature of Zürich is in winter 30·34°; in spring, 47·25°; in summer, 64·15°; in autumn, 49·05°: for the year, 47·95°. The temperature of London is in winter, 38·22°; in spring, 48·34°; in summer, 61·74°; in autumn, 50·29°: for the year, 50·50°.

Productions.—In S., where good coal is not to be had, and where the houses are built of wood, the forests, which cover one-sixth of the whole surface, acquire very great importance. Wood-cutting is one of the chief employments of the people. The trees cut down in the highlands are deprived of their branches, and shot with inconceivable rapidity over the slopes to the valleys below, whence they are removed by rafts, not only to different parts of S., but to France and Germany. It is, however, the mountain-pastures and the meadows, forming two-fifths of the whole surface of the country, that supply the chief occupations of the people—those of herdsmen and shepherds. During the summer, the cattle are driven into the mountains, and tended by herdsmen, who take up their abode in the rude wooden huts known as *chalets*, and there the butter and cheese are made. In summer, it is estimated that there are in S. upwards of a million of horned cattle, one-fourth of which consists of milch cows. The produce of the dairy annually is valued at between one and two millions sterling. The best breeds of cattle are those of Saanen and Simmenthal in Bern, Gruyères in Freiburg, Schwyz, Zug, Entlebuch, Pralligau in the Grisons, and Glarus. The best cheese is made at Emmen, Saanen, Simmenthal, Gruyères, and Ursern. The sheep of S. are of inferior breed, and their wool is short and coarse; but the goats are numerous and fine. More than two-thirds of S. does not supply corn enough to feed its inhabitants. The plain, however, is a fertile agricultural country. In Vaud and Neufchatel, the cultivation of the vine is the chief occupation of the people; and in the Thur hill-country, more particularly on the shores of the Lake of Constance, there are extensive orchards, in which are prepared cider and *kirschwasser*, the latter being a liquor largely consumed in Switzerland. It will give some idea of the extent to which S. is cultivated to state, that out of every 100 sq. m. of surface, 30 are occupied by rocks, glaciers, and water; 20 by hill-pastures; 17 by forests; 11 by arable lands; 20 by meadows; and 1 by vineyards. In the uncultivated part of the country, the bear, the wolf, and the larger birds of prey are still met with; and the Chamois (q. v.) is hunted. The rivers and lakes abound with fine fish, and more especially with trout.

Manufactures.—The manufacturing districts are not scattered over the whole surface of the country; they are met with only on the northern frontier. The chief manufactures are: at Zürich, silk-stuffs, to the value of £1,600,000 annually, and cottons; at St Gall and Appenzell, cottons; in Aargau and Glarus, cottons, linens, silks, and hosiery; at Basel, silk-stuffs to the value of £1,400,000, leather, paper, and tobacco; in Aargau and Lucerne, straw-plaiting; in Neufchatel, watch-making and cotton-printing; in Geneva, watch-making and jewellery. Although S. is inland, its commerce in proportion to population has long exceeded that of any other continental country. The chief imports are corn, salt, salt-fish, raw silks, and cotton, fruits and tropical produce, and the metals employed in watch-making. The exports are wood and charcoal, cattle, tallow, cheese and butter, silks and cottons, watches and jewellery. Internal communication has long been facilitated in S. by excellent roads, and every advantage has been taken of the lakes to introduce steam-navigation. The plain is now overspread from one end to the other with a network of railways, thus connecting closely all parts of the country. On Jan. 1, 1870, 840 miles of railways and 2870 miles of telegraph lines were in operation.

Government.—Hitherto, the Swiss have been very much split into distinct communities by the great mountain-chains which separate the cantons. One of the results has been the weakness of the central power. Each valley has been intrusted with the making of its own laws, and the management of its own local affairs. The cantons are, in fact, to this day in a great measure separate states. They are divided into two classes, absolute democracies and representative democracies. In the former, the chief power belongs to the *Landesgemeinde*, an assembly of the whole adult male population, which meets once a year, to pass laws, and to regulate the taxes and expenditure of the canton. Uri, the Unterwaldens, Appenzell, and Glarus have constitutions of this kind. In the Grisons and the Valais, the people may be said to possess similar powers, as all measures must be approved of by them. In the other, the representative cantons, a great council is elected by the people, and to it are deputed most of the powers of the Landesgemeinde. These local assemblies produce a remarkable effect on the Swiss people. Their debates have an importance far beyond that of an English town-council, or even of a colonial parliament, for their power is infinitely greater, and the population are more immediately interested in them. To the interest they excite is no doubt to be attributed in a great degree the intelligence and public spirit of the Swiss. Their greatest disadvantage lay in the power they formerly had to levy war against each other, and to resist the general government in conducting the foreign policy of the country. But these defects have been to a great extent remedied by the new constitution, which came into operation in 1848. It handed over the control of the army, the conduct of foreign affairs, the settlement of disputes between the cantons, and the management of the police and post-office, to a federal assembly (*Bundes Versammlung*) representing all the cantons. How far this assembly is entitled to interfere with the legislative action of the cantons, has not been very distinctly defined, but the tendency of legislation since its formation has been rather to trench than otherwise on their prerogatives. The federal assembly consists of two chambers, 1st, the State Council (*Stände rath*); 2d, the National Council (*National rath*). The former is composed of 44 members, 2 representing each canton; the latter, of 120 members, elected by the cantons in the proportion of 1 to 20,000 inhabitants. These bodies depute the executive authority to the federal council (*Bundes rath*), consisting of seven members, and holding office for three years. The president is merely one of the council, and he has none of the quasi-royal privileges of the American president, whose functions are discharged by the whole council. Different systems of law still prevail in the different cantons, which to some extent resemble each other, the most of them having grown out of the old German codes. Except in a few

frontier cantons, the Roman law has not been much regarded. In recent times, trial by jury has been introduced, but in the Catholic cantons the codes of law carry us back to the middle ages; they still prescribe for certain offences various degrees of corporal punishment, exposure on the pillory, and public penance in the churches. (See Rumbold's *English Government Report on the Penal Laws of Switzerland*, 1865.) In S. property is much subdivided, and this has exercised a very marked effect on the population. Of 485,000 heads of families, no less than 465,000 possess landed property. In the absence of great landed estates, there is no powerful aristocratic class. There are no titles of Swiss origin, families possessing such distinctions deriving them from abroad.

There is no standing army in S., but every citizen is obliged to serve as a soldier, and military drill is taught at all the schools. The Swiss regular force numbers 85,563; the reserve, 50,146. The whole expense of the military establishment was, in 1869, about $512,350. The national revenues in the same year amounted to $4,400,000, and the expenditure to $4,348,000.

Language and Religion.—In the sequestered valleys of the Grisons, two-thirds of the population still speak a Latin dialect known as the Romaunsh; Italian dialects have penetrated up the valleys of Ticino; French patois has invaded Western S., by the Rhine and the valleys of the Jura, to Laufen, the frontier of Soleure, Lake Morat, the Upper Saane, and Siders in the Valais. In the rest of S., the dialects are German. Of every 1000 Swiss, 702 speak German, 226 French, 55 Italian, and 17 Romaunsh. The Swiss Reformation spread chiefly from Basel, Bern, and Geneva, and the chief Protestant districts are the countries communicating with these towns. The Alpine region is almost entirely Roman Catholic, the seven Catholic cantons being Lucerne, Zug, Schwyz, Uri, Unterwalden, Valais, and Ticino. Out of 1000 Swiss, 411 are Roman Catholics, 587 Protestants, and 2 Jews.

Education.—In no country is elementary instruction more widely diffused. Parents are compelled to send their children to school from five to eight, but not above that age. There are universities on the German model at Basel, Bern, and Zürich, and academies on the French plan at Geneva and Lausanne. The number of clubs for scientific and literary, musical and social purposes, is most remarkable. There are no pursuits to which a class of men can devote themselves which are not represented by societies in Switzerland. The local political assemblies and other public meetings give ample employment to the newspaper and periodical press. In S. there are accordingly 188 political journals, and 167 periodicals devoted to literature and science. There are 40 daily papers. This active intellectual life is, however, chiefly confined to the Protestant cantons.

History.—S. was in Roman times inhabited by two races—the Helvetii, supposed to have been Celts, on the north-west; and the Rhætians (of whose origin we know nothing) on the south-east. After the conquest of Gaul, both races adopted the language and habits of Rome. When the invasions took place, the Burgundians settled in Western S.; while the Alemanni, another Germanic tribe, took possession of the country east of the Aar. A third Teutonic people, the Goths, entered the country from Italy, and took possession of the country of the Rhætians, which nearly corresponded with the Grisons. The Burgundians adopted Christianity in the end of the 5th c.; the Helvetii retained their old pagan creed until the 7th c., when they were converted by Irish monks, who founded abbeys and churches, which survive to our own time. S., in the early part of the middle ages, formed part of the German Empire, and feudalism sprang up in the Swiss highlands even more vigorously than it did elsewhere. During the 11th and 12th centuries, the greater part of S. was ruled on behalf of the emperors by the lords of Zähringen (q. v.), who did much to check civil wars, and to promote the prosperity of the towns. They, however, became extinct in 1218, and then the country was distracted by wars, which broke out among the leading families. The great towns united in self-defence, and many of them obtained imperial charters. In 1273, Rudolf of Hapsburg, a Swiss nobleman who had favoured the independence of the towns, became emperor. After doing so, he continued the same policy; but his son, Albert I. (q. v.), took another course. He attacked the great towns, and was defeated. The leading men of the Forest Cantons, which for ages had yielded a merely nominal recognition of the empire, and had acknowledged no feudal superior, met on the Rütli meadow, on 7th November 1307, and resolved to expel the Austrian bailiffs or landvögte. See TELL. The war terminated in favour of the Swiss at Morgarten in 1315. Schwyz, Uri, and Unterwalden, with Lucerne, Zürich, Glarus, Zug, and Bern, eight cantons in all, in 1352, entered into a perpetual league, which was the foundation of the Swiss Confederation. Other wars with Austria followed, which terminated favourably for the confederates at Näfels (q. v.) and Sempach (q. v.). In 1415, the people of the cantons became the aggressors. They invaded Aargau and Thurgau, parts of the Austrian territory, and annexed them; three years later, they crossed the Alps, and annexed Ticino, and constituted all three subject states. The Swiss were next engaged in a struggle on the French frontier with Charles the Bold of Burgundy. They entered the field with 34,000 men, to oppose an army of 60,000, and yet they were successful, gaining the famous battles of Granson and Morat in 1476. In 1481, the towns of Freiburg and Soleure were admitted into the confederacy. In 1499, the Emperor Maximilian I. made a final attempt to bring S. once more within the bounds of the empire. He sought to draw men and supplies from the inhabitants for his Turkish war; but in vain. He was defeated in six desperate engagements. Basel and Schaffhausen (1501), and Appenzell (1513), were then received into the Confederation, and its true independence began. The abbacy of St Gall, the cities of St Gall, Mühlhausen, and Bienne became associated states, with a vote at the Diet. Geneva, Neufchatel, Valais, and the Grisons, also became associated states, but without a vote.

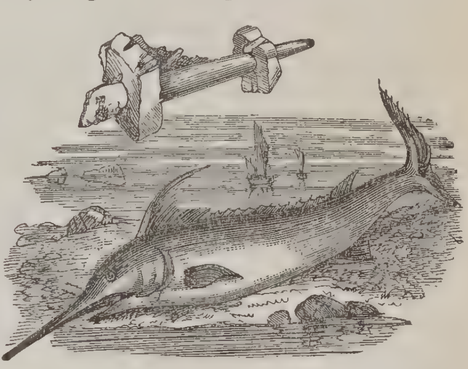
New troubles sprang up with the Reformation. Zwingli began to preach in the beginning of the century; and Zürich, in 1523, adopted his opinions, and was followed by Bern and other cantons of the north. The Forest Cantons remained attached to the Church of Rome. War broke out in 1531, between the Catholics and Protestants, and the former were successful at Cappel, where Zwingli was slain. This victory to some extent settled the boundaries of the two creeds in Eastern Switzerland. In 1536, however, Bern wrested the Pays de Vaud from the Dukes of Savoy, and annexed it to their own territory. In the same year, Calvin settled at Geneva, and the Reformed doctrines spread throughout Western Switzerland. During the Thirty Years' War, Bern, which had become, since the conquest of Vaud, the leading canton, and Zürich, contrived to maintain with great skill the neutrality of S.; and in the treaty of Westphalia, in 1648, it was acknowledged by the great powers as a separate and independent state. At this period, the Swiss, in

immense numbers, were employed as soldiers in foreign service, and the record of their exploits gives ample evidence of their courage and hardihood. Internally, there was great stagnation. The constitution of the larger cantons became more aristocratic, that is to say, the mass of the people lost their power over the governing bodies. In Zürich, Schaffhausen, and Basel, the governing councils were elected by the corporations; and in Bern, Freiburg, Soleure, and Lucerne, a few families had acquired permanent rule. At the end of last century, there was widespread discontent with this state of matters; but the French Revolution broke out, and wars followed, which left no time for its manifestation. In 1798, S. was seized by the French. At the peace of 1815, its independence was again acknowledged. The new Confederation was divided into 22 cantons, each of which was represented in a Diet, which was appointed to hold its annual meetings alternately at Bern, Zürich, and Lucerne. The old abuses which had crept into the constitutions of the cantons were revived, and representation in most of them became based on property qualifications. Officials, the aristocracy, and the clergy joined to oppose innovations, and succeeded in doing so until 1830, when the French revolution broke out. Armed demonstrations were made against the towns, and universal suffrage was generally conceded. Basel town, however, held out; but the difficulty was settled by the separation of the town and country districts—the former remaining conservative, the latter becoming democratic. Geneva and Neufchatel retained their old constitutions. The result of the changes was, however, that ⅔ds of the whole population were allowed to take part in public affairs. The consequences were not what had been expected by the liberals, who found that they had not yet the means of strengthening the central power. In 1839, at Zürich, where Dr Strauss had been appointed a professor of theology, a mob of peasants, headed by the Protestant clergy, overturned the government. In Aargau, a struggle took place between the liberals and the Ultramontane party, which was settled, after long discussion, by an unsatisfactory compromise. In Valais, where universal suffrage had put power into the hands of the reactionary party, a war took place, in which the latter were victorious. They then ruled with a strong hand, and actually forbade the celebration of Protestant worship within the canton. In Lucerne, the headquarters of the Jesuits, the Ultramontane party acted even more extravagantly; they so persecuted their political opponents, that the latter were compelled to leave the canton. These measures caused the greatest discontent. In 1844, a proposal was made in the Diet to expel the Jesuits; but that body declined to act. The radical party then determined to resort to force: they organised bodies of armed men, called the Free Corps, which invaded the Catholic cantons; but they were defeated. Changes favourable to them took place in some of the cantons. The Catholic cantons then formed a league, named the Sonderbund, for defence against the Free Corps. There was a general clamour for its suppression; but in the Diet, only 10½ votes were in favour of that measure. The ruling party in Geneva had been with the majority, and this conduct led to a revolution in that city. One vote was thus gained against the Sonderbund. St Gall added another; and a majority in the Diet, in 1847, declared the illegality of the Sonderbund, and decreed the expulsion of the Jesuits. In the war which ensued between the federal army and the forces of the Sonderbund, the former were victorious at Freiburg and Lucerne. The leagued cantons were made liable in all the expenses of the war, the Jesuits were expelled, and the monasteries were suppressed. An attempt was made by diplomatic notes to intimidate the Swiss government, but the revolution of 1848 broke out, and prevented further interference. In the same year, the radical party, convinced of the necessity of a more powerful central government, carried the constitution of 1848, of which we have already taken notice. Since then, the most important event which has taken place in S. was a rebellion against the king of Prussia, as Prince of Neufchatel. The canton was declared a republic, with a constitution similar to that of the other Swiss states. The king of Prussia protested, but in vain, against the change, and at length he withdrew all opposition, and remained satisfied with the bare title of Prince of Neufchatel, which he still retains.

SWI'VEL is a gun constructed, as regards its carriage, to turn on a pivot, or on two concentric iron rails. Its use is on shipboard or in a fortress.

SWORD, a well-known weapon of war, the introduction of which dates beyond the ken of history. It may be defined as a blade of steel, having one or two edges, set in a hilt, and used with a motion of the whole arm. Damascus and Toledo blades have been brought to such perfection, that the point can be made to touch the hilt and to fly back to its former position. In last century, every gentleman wore a sword; now the use of the weapon is almost confined to purposes of war. In the British army, all officers and sergeants, with troopers of cavalry, wear swords for cutting and thrusting. In the navy, all officers wear similar swords; and the men, in time of action, heavy-backed swords, called *cutlasses*. In the French service, nearly all troops wear a combination of the sword with the bayonet, called a sword-bayonet.—For various sorts of swords and their uses, see RAPIER, CUTLASS, BROADSWORD, SCIMITAR, SABRE, &c.; FENCING.

SWORD-FISH (*Xiphias*), a genus of fishes of the family *Scomberidæ*, having the upper jaw remarkably elongated and compressed, in the form of a sword or dagger. The body is rather of a long shape, and covered with very small scales. There are no teeth. There is one long dorsal fin. There are no finlets. The ventral fins are wanting. The sides of the tail are very strongly keeled. The tail-fin is large and forked. Only one species is known, *X. gladius*, plentiful in the Mediterranean, and in the warmer parts of the Atlantic; sometimes, but rarely, seen on the British coasts. It is bluish black above, and silvery white on the belly, the one colour passing gradually into the other. It is



Sword-fish (*Xiphias gladius*):
With section of a ship's timbers perforated by the sword.

highly esteemed as an article of food, especially when young. It is harpooned by the fishermen of the Mediterranean, and is powerful enough to drag a boat about for many hours after being struck. It has been said to attack the whale with its sword, but this is extremely improbable. Its food consists in great part of squids and cuttle-fish. The use of the sword is unknown. Instances not unfrequently occur of ships' bottoms being perforated by the sword of the S., but there is no good reason to think that an intentional attack is ever made.—Other species of S., belonging to genera closely allied to *Xiphias*, are found in the seas of different parts of the world.

SY'BARIS, and CRO'TŌN or CROTONA, two celebrated Greek colonies in Magna Græcia (q. v.). The former—founded 720 B. C., by Achæans and Trœzenians—was situated in the south of the Lucanian territory, between the rivers Crathis (*Crati*) and Sybaris (*Coscili*), about 3 miles from the Tarentine Gulf; and the latter—founded 710 B. C., by Achæans—about 50 miles south-south-east on the coast of Bruttium. All that is certainly known concerning these cities before the destruction of the former is, that they both rapidly increased in size, wealth, and power, extending their dominions across the peninsula, and founding other colonies, at the same time preserving the most friendly terms with each other. S. is said to have been 6 miles in circumference, and Croton 12 miles; the former being notorious for the excessive and fastidious luxury of its inhabitants (hence the term Sybarite), and the Crotoniates celebrated for the perfection they reached in athletic exercises—the famous athlete, Milo (q. v.), having been a native of Croton. Somewhere between 540—530 B.C., Pythagoras (q. v.) settled at Croton, and exercised very considerable influence over the aristocratic government. About 510 B. C., a democratic leader, Telys, deposed the oligarchy of S., banished 500 of the leading citizens, and assumed the tyranny of the city. The banished citizens having taken refuge in Croton, Telys demanded their surrender, and on being refused, declared war against that city. The Sybarites, with an army said to have amounted to 300,000, met 100,000 Crotoniates, commanded by Milo, at the river Træis, were completely routed, and their city obliterated by the latter changing the course of the Crathis, so as to sweep it away. About 443 B. C., Thurii was founded near the site of Sybaris. After the destruction of S., Croton appears to have gradually declined, suffering much from internal convulsions (see PYTHAGORAS), as well as from the disasters which befell it in its wars with the Locrians, Rhegians (480 B. C.), and Bruttians, and also in those of Dionysius (q. v.) of Syracuse and Pyrrhus (q. v.). Its ruin was completed in the second Punic war; and although, in 194 B. C., it was colonised by Roman citizens, it never again rose to be a place of any importance. Croton, in the time of Herodotus, and at a later period, was famous as a medical school.

The modern town of Cotronē, standing very near the site of the ancient town, has a population of 7168.

SY'CAMINE, a tree mentioned in Scripture, and supposed to be the Black Mulberry (q. v.).

SY'CAMORE, or SYCOMORE (*Sycomŏrus*), a genus of trees of the natural order *Moraceæ*, regarded by many botanists as a mere sub-genus of *Ficus* (see FIG), and differing from the true figs only in the elongated, straight, thickened, and club-shaped stigma. The species are chiefly African, but the geographical range extends also into the west of Asia. Some of them attain a large size and a great age. The EGYPTIAN S. (*S. Antiquorum*, or *Ficus sycamorus*) supposed to be the S. of the Bible, is a large tree, very abundant in Egypt and in some parts of the west of Asia, often planted near villages for the sake of its shade, its wide-spreading head sometimes covering a space of 40 yards in diameter. The figs are

Sycamore (*Acer pseudo-platanus*), shewing leaves, flowers, and fruit.

top-shaped, and grow in clustered racemes on the trunk and oldest branches. They are sweet, well flavoured, and somewhat aromatic. The wood is light, porous, and of little value. It has been supposed that the cases of Egyptian mummies are made of it, but this is disputed. Other species are found in Abyssinia, South Africa, &c.

The sycamore tree of Britain is a species of Maple (q. v.). In some parts of North America, the same name is given to the Plane (q. v.) of that country, *Platanus occidentalis*.

SY'DENHAM, a chapelry in the parish of Lewisham, county of Kent, with a station on the London and Croydon Railway, 8 miles south of London. It has become of world-wide celebrity in connection with the Crystal Palace, which was erected here in 1854, chiefly from the materials of the building of the Great Exhibition (1851). The cost of the erection and appointment of the Crystal Palace amounted to nearly £1,500,000. The building is 1600 feet long, 380 wide, and at the centre transept 200 feet high. The chief arts and sciences illustrated by the collections within the Palace and grounds, are Sculpture, Architecture, Painting and Photography, Mechanics and Manufactures, Botany, Ethnology, Palæontology, Geology, and Hydraulics. There are two concert-rooms, within the larger of which, performances have taken place at which there were 5000 vocalists and instrumentalists. The park and gardens occupy nearly 200 acres, and are adorned with sculptures, stone balustrades, &c., and fountains which are perhaps the finest in the world.

SYDENHAM, THOMAS, a great English physician, was born of good parentage, in 1624, at Winford Eagle, Dorsetshire, and was educated at Magdalen Hall, Oxford. According to the well known French surgeon, Desault, he afterwards studied at Montpellier. He graduated at Oxford as Bachelor in Medicine in 1640. Through the interest of a near relative, he obtained a fellowship of All Souls College, and there continued to prosecute his medical studies. He left the university without

taking a Doctor's degree, which, indeed, he did not obtain till some time afterwards at Cambridge. He settled as a practitioner at Westminster, and practised so successfully that, when only 36 years of age, he already enjoyed the reputation of being one of the first physicians of the period. In his later years, he was much afflicted by gout, which at length carried him off on December 29, 1689. He was buried in St James's Church. S. was not profoundly accomplished as a man of science; even in his own age, deficient as it was in the advanced development to which the researches on which medicine is based have now attained, he was inferior to several of his contemporaries; but in sagacity of observation and accuracy of diagnosis, he was unsurpassed. His skill and his philosophic cast of mind secured him the admiration and friendship of Locke; and his contributions to the literature of his profession received the praise of Haller and Boerhaave. His writings have been often republished both in England and on the continent, the edition entitled *Opera Medica*, which appeared at Geneva in 1716, being the best. Fevers were the department of medicine on which he first bestowed his attention; and before he had been many years in practice, he published, in 1666, his celebrated treatise entitled *Methodus Curandi Febres Propriis Observationibus Superstructa*. This was afterwards reprinted in 1675, with the observations accumulated in the interval. His treatment of the then destructive malady of smallpox was especially felicitous, substituting, as he did, for the stimulating regimen in vogue, the antiphlogistic method of cool air and salines. The most scholarly translation of his works into English is that of Dr R. G. Latham, published in the Sydenham Society's series, to which he gives its name.

SYD'NEY, the capital of New South Wales, and the oldest city in Australia, is situated on the southern shores of Port Jackson, in lat. 32° 52′ S., long. 151° 11′ E. The first party of British settlers that reached New Holland were landed at Botany Bay on January 20, 1788. The spot which they here selected being found ineligible, it was abandoned a few days afterwards, and the infant settlement was transferred to a point about seven miles further to the north, to the place where S. now stands. The choice of the new locality was chiefly determined by the circumstance of a stream of fresh water being found there, flowing into the deep inlet known as Sydney Cove, one of the numberless bays into which the basin of Port Jackson is divided. This last-mentioned magnificent expanse of water, completely land-locked, and admitting vessels of the largest size, extends for some 20 miles inland, ramifying in every direction. Its bold and rocky shores present a succession of picturesque and beautiful landscapes. The cliffs which form the general outline of the harbour often rise to a height of from 200 to 250 feet. In other points, the coast presents a lower level, consisting of a series of terraces and smooth sandy beaches. Perhaps there are few positions on the habitable globe more obviously suitable for the foundation of a great metropolis. Situated at a distance of about 8 miles from the sea, the whole circumference of the bay round which it is built forms a series of natural wharfs, where vessels of 2000 tons burden can be moored within a distance of 20 yards. The narrow entrance of Port Jackson — through what is called the 'Heads' — might easily be made inaccessible to any hostile fleet; whilst the central position of S. makes it necessarily the permanent emporium of the greater number of the British dependencies in the southern hemispheres. The immense coal formation of East Australia extends north and south for some 500 miles, with a breadth of from 80 to 100 miles. S. stands nearly in the centre of this great carboniferous basin; and at various points within a radius of from 30 to 100 miles, large quantities of coal are raised for colonial consumption as well as for export. The sandstone rock upon which the city is erected affords a valuable material for building.

Since the abolition of transportation, the growth of Sydney has been rapid, the population in 186 amounting to 93,596, and in 1881 to 220,427, including the suburbs. For many years, S. enjoyed a complete monopoly of the commerce of these antipodean regions. It has, however, now formidable rivals in Melbourne, Adelaide, and the settlements of Queensland. It must, however, always continue the exclusive outlet for the productions and commerce of extensive pastoral and mineral districts stretching to the north-west, west, and south-west.

The streets in the older parts of the town are narrow and irregular: in the newer portions, care has been taken to avoid these defects; and several of the modern streets, from their breadth and the size and style of the buildings, are not behind those of the principal towns of Europe. The shops, warehouses, and private buildings in George and Pitt Streets present long and compact lines of well-built stone edifices, often assuming a very ornate and ambitious style of architecture. The chief thoroughfares are paved, and lighted with gas, and a system of underground drainage has been carried out at a cost of nearly half a million sterling. There is also an abundant supply of pure water, the source of which is a natural reservoir known as the Botany Swamps.

The *climate* of S. is, upon the whole, temperate and healthy. The chief meteorological conditions during the year 1862 were as follows: The mean temperature for the year, 62·6° Fahr.; for February, 72·1°; for July, 52·5°. The mean maximum for the year, 69·8°; for February, 78·8°; for July, 59·6°. The mean minimum for the year, 55·3°; for January, 65·6°; for July, 45·5°. The rain-fall, 47·09 inches; number of rainy days, 152.

Public Buildings.—By far the most important edifice, not only in S. but in the whole of the Australian settlements, is the university, which stands on a commanding height, and in the centre of a domain of about 150 acres. The principal façade is 500 feet in length, and is flanked at its western end by the Great Hall, the proportions of which are such that, were it in England, it would rank as the third in point of size. Lectures are delivered daily during each term on classics, logic, history, chemistry, natural and experimental philosophy, and jurisprudence. The Museum contains a collection of Greek, Roman, and Egyptian antiquities presented by the former chancellor, Sir C. Nicholson. There are two suffragan colleges in connection with the university—that of St Paul's, belonging to the Church of England; and St John's, erected under the auspices of the Roman Catholic community. The university, erected out of public funds, has a permanent endowment of £5000 a year from the Civil List; and each of the suffragan colleges receives aid towards its building fund, and the stipend of the warden and rector. Eighteen free scholarships, of the annual value of £50 each, are established in the university, in addition to several others that have been founded by private benefactors. The university is incorporated under an act of the Colonial Legislature and by royal charter. It is only empowered, however, to confer degrees in arts, law, and medicine; and, so far as the university is concerned, instruction is limited to

purely secular teaching. The religious training of the pupils is left to the affiliated colleges. The metropolitan cathedral of St Andrew has been 50 years in the course of erection, and is still unfinished. Its style is that of the later perpendicular. Many of the churches, upwards of 60 in number, belonging to different religious denominations, are tastefully designed. Amongst the buildings devoted to secular purposes, the most imposing and effective, in point of size and architectural design, are the residence of the governor, the museum of natural history, the exchange, the custom-house, and the public grammar-school. The neighbourhood of S., with every nook in the adjacent bays, is studded with elegant villas and snug cottages, surrounded by their park-like grounds, and gardens of orange-trees, bananas, and numberless semi-tropical plants unfamiliar to the English eye of the newly-arrived immigrant. Several manufactories have been established in S.; but the gold discovery has hitherto arrested their progress or altogether destroyed them. S. has two theatres, several mechanics' institutes, a large hospital for the sick, an orphan asylum, and various other charitable and benevolent institutions, all of which are liberally endowed and supported by public grants or private munificence.

SYE'NE. See Assouan.

SY'ENITE, a granitic rock found near the city of Syene, in Egypt. It is composed of quartz, felspar, and hornblende, and differs from true granite in having the mica replaced by hornblende. The felspar is generally red (sometimes it is found of a white colour), and the hornblende gives a mottled red and dark green colour to the rock.

SY'LLABUB, a culinary preparation, formerly much more used than at present. It consists of sugar and cream flavoured with brandy, sherry, and lemon rind and juice, worked into a froth, and served up in that state in glasses.

SY'LLOGISM, a name expressing a principal branch or department of Logic. When we reason, or get at truth by means of inference, we are said to proceed either inductively (see Induction) or deductively. Deductive reasoning, when fully and methodically expressed, takes the form called the syllogism. 'This thing will sink in water, for it is a stone,' is a deductive argument, but not fully stated; the complete form is: 'Stones sink in water; this is a stone; therefore, this will sink in water'—which form is called a syllogism.

To a perfect syllogism it is necessary that there should be three, and no more than three, *propositions* (see Proposition); these are the conclusion, or the matter to be proved, and two others that are the means of proving it, called the premises. It is also necessary that there should be three, and no more than three, *terms*, namely, the subject and the predicate of the conclusion, and one, called the middle term, which must occur in both premises, being the connecting link for bringing the two other terms together in the conclusion. The *predicate* of the conclusion is called the major term, because it is in its scope the largest of the three; the *subject* of the conclusion is the minor term, as being the smallest in scope. The three terms enter into the premises in this manner: the major term and middle term make one premise, called the major premise; the middle term and the minor term make the minor premise. In the syllogism above stated, the terms are, 'a thing that will sink in water' (major), 'this thing' (minor), 'stone' (middle); the premises are, 'stones sink in water' (major), 'this thing is a stone' (minor); the conclusion is, 'this thing will sink in water.'

The form now given, although the regular and fundamental form to prove any affirmative conclusion, is not the only form that an argument may assume. The totality of syllogistic forms is divided into *figures*, and each figure into *moods*, which are the distinct syllogistic forms; the principle of division being as follows. The figure is determined by the position of the middle term; which may be the *subject* of the major premise, and the *predicate* of the minor (1st figure), the *predicate* in both (2d figure), the *subject* in both (3d figure), the *predicate* of the major and the *subject* of the minor (4th figure).

The word 'figure' is borrowed from rhetoric, where it means a departure from plain and ordinary speaking, as metaphor, hyperbole, &c. But, as remarked by Hamilton, only the last three of the foregoing enumeration should be called 'figures.' The first should be considered as embracing the regular forms of reasoning, and the others as properly figures—that is, forms more or less inverted, irregular, or unnatural, although still correctly representing reasonings that actually occur. These forms may be all *reduced* to forms in the 1st figure; their inversions or distortions being, as Hamilton would say, *redressed*, or restored to the primitive and fundamental type, namely, the syllogisms of the 1st figure.

The 4th figure did not belong to the original scheme of Aristotle, and it is usually considered as both unnatural and unnecessary, being only an awkward inversion of the first. There would then be the natural or standard syllogisms (the 1st fig.), and two sets of figurative departures from them (2d and 3d figs.).

The syllogisms of each figure are said to differ in *mood*, or according to the *quality* and the *quantity* of the propositions—that is, according as these are affirmative or negative (quality), universal or particular (quantity).

The entire scheme may be presented as follows: The symbols used are P (predicate of conclusion), major term; S (subject of conclusion), minor term; M, middle term. The general type of the first figure or standard is:

M is P.
S is M.
S is P.

When the quality and the quantity of the propositions are expressed, there arise four syllogisms of this form—two affirmative, and two negative:

$$\left.\begin{array}{l}\text{All M are P.}\\ \text{All (or some) S are M.}\\ \text{All (or some) S are P.}\end{array}\right\}\ \textit{Barbara, Darii}$$

All matter gravitates.
All (or some) air is matter.
All (or some) air gravitates.

$$\left.\begin{array}{l}\text{No M is P.}\\ \text{All (or some) S is M.}\\ \text{No S is P; some S is not P.}\end{array}\right\}\ \begin{array}{c}\textit{Celarent}\\ \text{and}\\ \textit{Ferio.}\end{array}$$

No matter is destructible.
All (or some) air is matter.
No air is destructible; some air is not destructible.

The general scheme of the 2d *figure* is:

P is M.
S is M.
S is P.

There are four syllogisms in all, which we may take in pairs thus:

$$\left.\begin{array}{l}\text{No P is M.}\\ \text{All (or some) S are M.}\\ \text{No S is P; some S are not P.}\end{array}\right\}\ \begin{array}{c}\textit{Cesare}\\ \text{and}\\ \textit{Festino.}\end{array}$$

'No destructible thing is matter,' &c., as in the last form.

All P is M.
No S is M; some S is not M. — *Camestres* and *Baroko.*
No S is P; some S is not P.

In this figure, there is a certain distortion of the previous or regular figure. In the first of the two pairs, the major is, No P is M, instead of the equivalent (1st figure), No M is P. In the first form of the second pair, the minor is, No S is M, instead of the equivalent, No M is S, which should be the major to be regular; the amended premises would then give, in conclusion, No P is S, equal to No S is P.

All matter is extended.
No mind is extended. — *Camestres.*
No mind is matter.

The last form, with a particular conclusion, is exemplified thus:

All matter is extended.
Some things are not extended.
Some things are not matter.

This is a form technically called *Baroko*, which is one of two that are especially difficult to reduce to the standard forms.

This figure proves only negatives.

The scheme of premises in the 3d *figure* is

M. P.
M. S.

Six varieties of syllogism come under this figure; we may arrange them in three pairs, the first two pairs having the same major, and the third the same minor:

All M is P.
All (or some) M is S. — *Darapti* and *Datisi.*
Some S is P.

All planets move.
All (or some) planets are heavenly bodies.
Some heavenly bodies move.

No M is P.
All (or some) M is S. — *Felapton* and *Ferison.*
Some S is not P.

No solid body is perfectly transparent.
All solid bodies gravitate.
Some gravitating things are not perfectly transparent.

Some M is P; some M is not P.
All M is S. — *Disamis* and *Bokardo.*
Some S is P; some S is not P.

The first of the two is merely a standard syllogism (Darii), with transposed premises; the second (Bokardo) is more complicated, as in the example:

Some men are not fit to rule.
But all men are liable to have dominion.
Some men, liable to have dominion, are not fit to rule.

In the 4*th figure*,

P is M,
M is S,

there are five syllogisms. The mere forms are enough to quote.

All P are M.
All M are S. — *Bramantip.*
Some S are P.

All P are M.
No M is S. — *Camenes.*
No S is P.

Some P are M.
All M are S. — *Dimaris.*
Some S are P.

No P is M.
All M are S. — *Fesapo.*
Some S are not P.

No P is M.
Some M are S. — *Fresison.*
Some S are not P.

The reasons why these syllogisms are true, and why no other of 256 possible combinations of propositions can give true conclusions, are certain laws, called the rules of the syllogism, which repose on first principles of the highest certainty.

Mr Mill has laid down the following fundamental axioms of the syllogism, as stated in its standard forms in the 1st figure. (1.) 'Attributes coinciding with the same attribute, coincide with one another.' M, the middle term, coincides with P, the predicate; S, the subject, coincides with M; therefore S and P coincide with one another. (2.) 'Any attribute incompatible with a second attribute, is incompatible with whatever that second attribute coincides with.' No M is P; M is incompatible with P; but S coincides with M, and therefore it also is incompatible with P.

All the syllogisms of the last three figures are reducible to the first, by conversion of propositions and transposition of premises, according to the nature of the case. The symbolic name of each syllogism contains instruction for this process, as well as stating the composition of the syllogism. To aid the memory, these symbols are put together in five Latin hexameter verses of very ancient but unknown origin:

'Barbara, Celarent, Darii, Ferioque prioris.
Cesare, Camestres, Festino, Baroko, secundæ.
Tertia Darapti, Disamis, Datisi, Felapton,
Bokardo, Ferison habet, quarta insuper addit
Bramantip, Camenes, Dimaris, Fesapo, Fresison.'

The first line gives the standard figure, and states the propositions entering into each syllogism. The three A's in Barbara are three universal propositions. The E, A, E, in Celarent, are a universal negative, a universal affirmative, a universal negative; in Darii, A, I, I, a universal affirmative and two particular affirmatives, &c. In the other figures the commencing letter (C, B, &c.) shews which standard syllogism each is to be reduced to (Baroko to Barbara, Cesare to Celarent, &c.). The consonant *s* means simple conversion of the proposition marked by the preceding vowel; *p* means conversion by limitation, or *per accidens; m* signifies the transposition of the premises; *k* occurs in Baroko and Bokardo, and denotes that these are to be reduced by supposing the conclusion false, and then shewing that on that supposition Barbara would be contradicted—from which it is inferred that the original form is true.

There are some species of deductive arguments that do not fall under the syllogistic figures. Thus, the major may state a conditional proposition, and the minor affirm the truth of the condition. 'If the witness is to be believed, the man is guilty' (major); now 'the witness is to be believed' (minor); therefore 'the man is guilty.' A true conclusion would also be obtained by a minor denying the consequent, 'the man is not guilty.' It would then follow that the witness (who affirms his guilt) is not to be believed. But no conclusion would follow from either denying the condition, 'the witness is not to be believed,' or affirming the consequent, 'the man is guilty;' for, in the first place, the man might be guilty whether this particular witness be credible or not; and secondly, the guilt of the man does not prove the credibility of the witness. This is called the *Conditional* Syllogism.

Again, the major may be what is called a Disjunctive or Alternative Proposition, from which also inferences may be drawn by supplying certain minors. 'This was done by either A or B;' now 'it was not done by A (or by B);' therefore 'it was done by B (or by A).' Should the major be understood to mean that it was done by one, and not by both, there would be two other possible inferences. 'It was done by A (or by B);' therefore 'it was not done by B (or by A).' There are other disjunctive pairs, as for example: 'Either A is B, or C is D;' now 'A is not B, therefore C is D,' &c. This is called the *Disjunctive* Syllogism.

A combination of the Conditional and the Disjunctive makes the *Dilemma*. For example:

> If A exist, then either B or C exists.
> Neither B nor C exists.
> Therefore A does not exist.

The following dilemma was given to refute the practice of torturing witnesses: 'A person able to endure pain will be likely to utter falsehood under torture; one unable will be equally likely; therefore, a person under torture will be likely to utter falsehood.'

A very great enlargement has been given to the doctrine of the syllogism, by Sir W. Hamilton (see QUANTIFICATION), Professor De Morgan, and the late Professor Boole of Cork. They have shewn that many more syllogistic pairs can be created, and have invented symbols for the purpose. It is, however, comparatively few, either of the old pairs or of the new, that are assumed by the ordinarily occurring arguments, either in the sciences or in common affairs. By far the most useful part of the syllogism is contained within the limits of the 1st or standard figure, which shews what premises are to be looked out for to prove any conclusion; namely, some *general assertion* of matter of fact, affirmative or negative (major), and a *particular assertion* that a given thing comes under the subject of the general assertion (minor), and therefore falls likewise under its predicate. When an argument is stated in a puzzling or perplexed form, with perhaps the omission of one of its essential propositions, it is well to know how to supply the suppressed premises, and put the argument into regular order: the truth or fallacy of the reasoning then becomes evident at a glance.

SYLPHS, in the fantastic system of the Paracelsists, are the elemental spirits of the air, who, like the other Elemental Spirits (q. v.), hold an intermediate place between immaterial and material beings. They eat, drink, speak, move about, beget children, and are subject to infirmities like men; but, on the other hand, they resemble spirits in being more nimble and swift in their motions, while their bodies are more diaphanous than those of the human race. They also surpass the latter in their knowledge, both of the present and the future, but have no soul; and when they die, nothing is left. In form they are ruder, taller, and stronger than men; but stand nearest to them of all the elemental spirits, in consequence of which they occasionally hold intercourse with human creatures, being especially fond of children, and of simple harmless people; they even marry with our race, like the Undines and the Gnomes, and the children of such a union have souls, and belong to the human race.

In common usage, the term sylph has a feminine signification, and is applied to a graceful maiden. How this curious change of meaning occurred, is not quite certain; but it is probably owing to the popularity of Pope's *Rape of the Lock*, which introduced the term into the world of fashion and literature. For although even in Pope, the sylph that guards Belinda is a *he*, yet the poet so refined and etherialised his spiritual agents, that they soon came to be associated with all our ideas of feminine grace and beauty; and this circumstance may have reacted on the popular idea—always loose and inaccurate—of their character and sex, and brought about the change of gender to which we have alluded. See Paracelsus's *Liber de Nymphis, Sylphis, Pygmæis et Salamandris et Cœteris Spiritibus* (Basel ed. of Paracelsus's works, 1590).

SYLVESTER, the name of two popes, and of a third who was an anti-pope. The pontificate of the first immediately succeeded that of Melchiades in 314, and is memorable for the great council of Nicæa, in which the heresy of Arius was condemned. S. himself did not attend the council, but sent two priests—Vitus and Vincentius—to take his place. His name is also celebrated in connection with the so-called donation of Constantine to the Roman Church, the spuriousness of which (although no doubt had been raised regarding it during many centuries) has long been admitted by critics. He died in 335.—Sylvester II., one of the most learned of the medieval popes, originally called Gerbert, was born at Aurillac, in Auvergne, early in the 10th century. He was educated in the monastery of his native village; but went early to Spain, where he learned mathematics, and afterwards to Rome. He was appointed abbot of the monastery of Bobbio, where he taught with much distinction and success. At a later period he went to Germany as preceptor of the young Prince Otho, afterwards Otho II.; and ultimately became secretary to the Archbishop of Rheims, and director of the cathedral school, which became eminent under his care. The archbishop having been deposed, S. was elected to the archbishopric; but he was afterwards set aside, the deposition of his predecessor having been declared invalid. In the year 998, however, he was appointed Archbishop of Ravenna, whence he was called to the pontifical throne, in the following year, under the name of Sylvester II. He was a man of rare acquirements for his age. He was an adept in mathematics, and in practical mechanics and astronomy, in which department his attainments acquired for him among his contemporaries the evil reputation of a magician. He is also believed to have been acquainted with Greek, and perhaps with Arabic. Of all his works, which were numerous, his letters (printed by Du Chesne in the *Historians of France*) have attracted most notice from their bearing on the history of an obscure period.

SYLVESTER, JOSHUA, was born in 1563. His life was divided between the somewhat incongruous pursuits of merchandise and poetry, in neither of which did he achieve a distinct success. Of his original works, the human memory retains no trace; but in virtue of the great, though fleeting popularity obtained by his English version of the *Creation* of Du Bartas, from which Milton is thought to have derived some hints, he lives in literary history as a sort of *nominis umbra*. He led a somewhat wandering life, and died at Middleburg, in Holland, in the year 1618.

SYLVI'ADÆ, a family of birds, of the order *Insessores*, and tribe *Dentirostres*, including a very great number of small species, among which are many of the birds most noted for sweetness of song, whilst something of this power is possessed by almost all the family, so that the name *Warblers* is often used as synonymous with Sylviadæ. The bill is sharp, slender, straight, and rather compressed towards the tip; the wings moderately long; the legs slender. To this family belong the Nightingale, the Blackcap, numerous species known by the name

or Warbler, the Redbreast, Redstart, Wheatear, Whitethroat, Stonechat, Whinchat, Golden-crested Wren, Hedge-sparrow, &c. The S. are diffused over all parts of the globe; and some of those found in tropical countries possess considerable musical powers, but are generally as silent during the great heat of the day as during the darkness of night, and are chiefly to be heard early in the morning.

SYMBO'LIC BOOKS, in the language of the church, is a phrase that signifies the same as Creeds and Confessions (q. v.). The name is derived from the Greek *symbolon*, a sign or mark by which anything is known—a creed being the distinctive mark of a religious community.

SYME, JAMES. See SUPPLEMENT in Vol. X.

SYMMACHUS, Q. AURELIUS, a distinguished Roman orator, scholar, and statesman who flourished towards the close of the 4th c., was educated in Gaul, and after holding several lesser offices, became prefect of Rome (384 A.D.). Seven years later he was raised to the consulship. The date of his death is unknown, but we know that he was alive in 404 A.D. The character of S. is a very fine one. A sincere pagan in an age when classic paganism was almost extinct, he proved in his own person a pattern of its choicest virtues, and manfully, if in vain, strove to regain for it a place of honour in the state. S.'s extant writings consist of ten books of letters (*Epistolarum Libri X.*) and the fragments of nine orations. The former were published after his death by his son, and contain not a little that is valuable in relation to the history of the period; but the style is in general a slavish imitation of Livy. The best editions of the Epistolæ are those of Juretus (Par. 1604) and Scioppius (Mainz, 1608). The fragments of the orations were first discovered by Cardinal Mai in a palimpsest of the Ambrosian Library, and were first published at Milan in 1815; afterwards, with some additions, at Rome in 1823, in *Scriptorum Veterum Nova Collectio.* See Morin's *Etude sur la Vie et les Ecrits de Symmaque, Préfet de Rome* (Par. 1847).

SY'MMETRY OF ORGANS. Throughout the animal kingdom, a symmetry of organs very generally prevails in the two sides of the body. This is the case in man and in all the *Vertebrata;* more perfectly, however, in the external than the internal organs, the two sides of the body presenting great diversities in the circulating, digestive, and other systems. Even the external organs, although similar on the two sides, are never perfectly so. On comparing the two hands, for example, the veins of the one will be seen to differ from those of the other. In *Mollusca*, the symmetry of the two sides sometimes exists, and is sometimes entirely lost, the one side remaining undeveloped in the growth of the animal. In the *Articulata*, the symmetry is in general as perfect as in the *Vertebrata*, and in the internal structure even more so. In the *Radiata*, the whole type is very different, and a very different kind of symmetry appears, not with reference to two sides, but to the rays into which the body divides.

In the vegetable kingdom, a symmetry is found, more or less perfect, but never completely so, between the two sides of leaves, fronds, &c. In flowers, a symmetry appears in the regular distribution of sepals, petals, stamens, &c., around the centre of the flower; and even those flowers which least exhibit it when fully blown, as papilionaceous flowers, possess it in the early stages of the bud as perfectly as others.

SYMPATHE'TIC INK. See INK.

SY'MPATHY (Gr. *sympătheia*, fellow-feeling) may be defined as the assumption by different individuals, or by different parts of the same individual, of the same or an analogous physiological or pathological state at the same time or in rapid succession. The late Dr Todd (art. 'Sympathy' in the *Cyclopædia of Anatomy and Physiology*) divides all the examples of sympathy which are included in the above definition into three classes; first, sympathies between different individuals; secondly, those which affect the mind, and, through it, the body; and, thirdly, those which are strictly organic, and therefore physical.

As examples of the *first class* may be mentioned the readiness with which the act of yawning is induced in a company, if a single person begins to yawn; the facility with which hysterical convulsions are induced in a female hospital ward by a single case; the fascination of its prey by the serpent, apparently by the power of the eyes; the similar power exerted by so-called electro-biologists and mesmerists, and by which some men can control even the fiercest carnivora. Of these sympathies the only explanation that can be given is that suggested in the article on ANIMAL MAGNETISM (q. v.). As examples of the *second class*, the following cases may be adduced. Certain odours—as of strawberries, mutton, cats, and other most diverse objects—will induce fainting in some people; the smell of a savoury dish will excite a flow of saliva in the mouth of a hungry person; and the excitement of the emotions of pity will produce a copious flow of tears. In these cases, an affection of the mind is a necessary link, but why that affection of the mind should produce its peculiar effect, is a question not easily answered; but it is plain that the portion of the nervous centre which is affected in such cases, must have a direct influence upon the parts in which the sympathetic phenomena appear, through commissural (or connecting) fibres, or the continuity of its gray matter with that of the centre from which its nerves immediately spring. Examples of the *third class* occur in the pain in the knee which arises from disease of the hip-joint; the pain in the right shoulder from disease of the liver; the pain over the brow on taking a draught of iced water into the stomach; the various spasmodic affections connected with intestinal irritation, or the irritation of teething; the vomiting that occurs on the passage of a biliary or renal calculus, &c. All these cases may be more or less satisfactorily explained by the known laws of the sensory and motor nerves. In some of these cases the explanation, however, cannot be regarded as altogether complete. For example, the pain over the brow from the ingestion of cold water or ice into the stomach, may be referred to irritation of the gastric branches of the pneumogastric nerves communicated in the medulla oblongata to the fifth nerve; but why the irritation should be confined to the frontal branch of the first (or ophthalmic) division of the fifth nerve, we are utterly unable to explain.

SY'MPHONY, in Music, a word used in two different senses: 1. The instrumental introduction and termination of a vocal composition, sometimes called *ritornello;* 2. A composition for a full orchestra, consisting of from three to six movements. It is for the orchestra what a Sonata (q. v.) is for a single instrument; but generally of greater length, and its movements more fully and richly developed, the subjects introduced being worked out in broader masses. The most usual though not unvarying order of movements is a brilliant allegro, ushered in by a slow introduction, an adagio or andante, a minuet with its trio, a short sportive movement called a scherzo, and a lively finale. The symphony is one of the highest of musical compositions, and one in which excellence is rare. Haydn, Mozart, Beethoven, and Mendelssohn are among the few successful composers of symphony; and the nine symphonies of Beethoven are generally acknowledged

to be the greatest works of their class. The Overture (q. v.) is in form not unlike a symphony, but much shorter; but the terms symphony and overture were at one time used almost synonymously, and several of Haydn's early symphonies are called overtures. At the present day the overture in the composer's score of an Italian opera is called *Sinfonia*.

SY'MPHYTUM. See COMFREY.

SY'MPTOMS (Gr. *sympiptein*, to concur), in Medicine, are the morbid phenomena by which the physician becomes aware that derangements of some kind have taken place in the economy; but it requires a mental effort to convert these symptoms into signs of disease. A symptom thus converted into a sign of some special disease or disordered condition, tends to constitute the *diagnosis*, or recognition of the disease. 'The interpretation of symptoms,' as Dr Aitken observes, 'can only be successful after a close observation of the patient—often prolonged and repeated for more complete investigation—so as to connect the results arrived at with his previous history. The utmost logical acumen is required for the due interpretation of symptoms. The individual value of each ought to be duly weighed; one symptom must be compared with another, and each with all, while the liability to variation of a similar symptom in different cases of a like kind must not be forgotten. Thus only can the nature of a disease be clearly determined, its severity and dangers fully appreciated, its treatment indicated, and the probability of recovery foretold.'—*The Science and Practice of Medicine*, 3d ed., vol. i., p. 9. Many writers, following the example of Laennec, confine the term *symptom* to the phenomena depending on vital properties; while those phenomena of disease which are more directly physical, they call *signs*. We thus have what may be called *physical signs* and *vital symptoms*. The form, size, colour, firmness or softness, heat and odour of a part of the body, the sounds which it yields on percussion or discultation, &c., afford *physical signs;* while *vital symptoms* may be exemplified in pain, uneasiness, altered or impaired sensations, spasm, vomiting, the accelerated pulse and hot skin of fever, the state of the tongue and of the alvine and urinary excretions, &c. The term *semeiology* (literally, *the theory of signs*) has been given by medical writers to the general study of this subject, which is admirably discussed in Williams's *Principles of Medicine*.

SY'NAGOGUE (Gr. = *ecclesia;* Heb. *beth-hakkeneseth*, house of assembly), a Jewish place of worship. The origin of this institution is probably to be traced to the period of the Babylonian captivity, although tradition finds it in the patriarchal times. When, at the time of Ezra, and chiefly through Ezra's instrumentality, the ancient order of things was re-established in Judea, synagogues were established in all the towns for the benefit of those who could not take part oftener than three times a year, or not even as often as that, in the worship of the temple at Jerusalem, and a special ritual of lectures and prayers was instituted. From the time of the Maccabees, we find them even in all the villages; and Josephus, Philo, the New Testament, the Mishna, and the Talmud, constantly allude to them. Common prayer and religious instruction were the purpose for which the people there met. The Sabbaths and feast-days were the principal times on which the faithful assembled in them; and they contributed more than anything else to the steadfast adherence of the people to their religion and liberty as long as there was any possibility of keeping both intact. At the same time, they gradually undermined the priestly and aristocratic element that gathered round the temple, its gorgeous worship and kingly revenues. Little is known of any special laws respecting the construction of these buildings, save that the faces of the worshippers should be directed towards Jerusalem (*misrach* = eastwards) (see MOSQUE); or that, in accordance with a verse in the Psalms, there should be a slight descent of a step or two on entering it, or that it should stand, if feasible, on a slightly elevated ground, or be somehow or other made visible far off. Erected out of the common funds or free gifts of the community, it had also to be supported by taxes and donations. All profane doings were strictly prohibited in it. No eating, drinking, reckoning, and the like, were allowed; and even as to dress and other things of general decorum, the reverence due to the place was enforced as rigidly as possible. It represented in miniature the form of the temple, itself an enlarged type of the tabernacle. At the extreme eastern end was the *Aron hakkodesh*, the holy ark, containing several copies of the Pentateuch, from which the periodical readings were chanted. In front of this was the stand of the public reader of the prayers, not far from which was suspended the everlasting lamp (*ner tamid*). On a raised platform in the middle of the synagogue, was the place of the reader or preacher. The women sat separated from the men by a low partition five or six feet high. The affairs of the synagogue were administered by a board of 'ancients' or 'elders,' at whose head stood a chief or principal (*Rosh hakkeneseth* = *archisynagogos*). This college managed the inner affairs of the synagogue, and had even the power of excommunication. The officiating minister, whose office it was to recite the prayers aloud, was called *sheliach tzibbur*—messenger of the community (*angelos ecclesias*, Rev.). His qualifications were, among others, to be active, to be father of a family, not to be rich or engaged in business, to possess a good voice, to be apt to teach, &c. The beadle, or *chazzan*, had the general charge of the sacred place, and its books and implements. He had to present the scroll to the reader, and assist on other occasions. During the week-days, he had to teach the children of the town or village. He too had to be initiated by a solemn imposition of hands. This name of chazzan, however, at a later period, came to designate the officiating minister, and it has retained that meaning until this day. Almoners or deacons, who collected and distributed the alms, possibly the same as the *Batlanim* or 'idle men,' whose office in relation to the synagogue cannot be exactly determined now, but who had always to be ready for the purpose of making up the requisite number of *ten* worshippers, were further attached to the general body of officials. Respecting the prayers used, we have spoken under LITURGY (JEWISH). As to the time of daily worship, we may observe that the third, sixth, and ninth hours of the day were the times appointed for it, and the more special days were the Monday and Thursday, when the judges sat, and the villagers came to town; and the Saturday, on which the forms of some of the prayers were altered according to the occasion.

On the connection between the Jewish synagogue and the Christian church, and their respective rites and modes of worship, we cannot here enlarge. Thus much, however, we may say, that it is obvious to the most superficial observation that the principal practices of the latter belong, with certain modifications, to the former; and it has been conjectured that even the melodies of certain hymns still sung in the Roman churches are to be traced to the temple and the synagogues. It is, moreover, well known that the early Christian churches were entirely organised after the pattern of the synagogues. As to the judicial

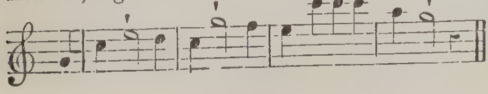
power exercised by the officers of the synagogue, we refer to SANHEDRIM. They had, there can hardly be a doubt, a kind of authority with regard to religious transgressions; but how far they were allowed to carry this authority, is not so easily determined. Modern synagogues differ but in some minor points—additional prayers and the like—from what we gather to have been the nature of those at the time of Christ, save that there are no more elders, but a simple board elected from the community, without any authority beyond that of, perhaps, a board of churchwardens, and that the chazzan, as we said, has now the functions of the 'sheliach.' See JEWS, TEMPLE, LITURGY (JEWISH), &c. The languages used in the early synagogues of Palestine and Alexandria, were Hebrew, Aramaic, and Greek respectively.

SY'NAGOGUE, THE GREAT (*keneseth haggedolah*), an assembly or synod, supposed to have been founded and presided over by Ezra, consisting of 120 men, said to have been engaged in remodelling the national and religious institutions of the Jews after the return from Babylon. The palpable chronological discrepancies that occur in the early accounts about this synod, together with other doubtful points, have led modern scholars to deny its existence completely. But the fact of Josephus not mentioning it avails very little against the positive assertions of the Talmud, and what is still more important, of the Karaites, the professed adversaries of all tradition. True, Ezra, the contemporary of Artaxerxes, can never have taken his place in it together with Zerubbabel and Joshua, who left Babylon under Cyrus, or with Simeon the Just, who lived at the time of Alexander the Great. These, however, are but apparent anachronisms. The tradition never meant anything else than that the institution founded by Ezra, and which lasted up to the time of Alexander, comprised 120 men, of whom Simeon was one of the last. Anyhow, there is absolutely no reason to doubt that Ezra and Nehemiah did a certain amount of work which they could not have done without being assisted by eminent collaborators. It was this body to which certain vital ameliorations in the administration of justice are ascribed. They developed public instruction, and fixed and enlarged the Mosaic laws by certain rules of interpretation. 'Be circumspect in judgment; make many disciples; and erect a fence around the law;' are some of the principal sayings ascribed to them. Above all, it seems to have been the office of Ezra and his coadjutors—the men of the Great Synagogue—to collect, purify, and redact the sacred books as much as in them lay. Whether, however, they really introduced the vowel-points, which have been handed down to us by the Masoretes, instituted the Feast of Purim, sanctioned the Eighteen Benedictions (see LITURGY, JEWISH), &c., is more than doubtful. They certainly disappeared before the Sanhedrim (q. v.) were instituted, but it may be that their legislative functions were no longer needed at that advanced period.

SYNA'NTHERÆ. See COMPOSITÆ.

SYNCLI'NAL AXIS is the line of curve in the trough of a series of beds from which the strata rise on either side. The ridge-curve is called the anteclinal axis.

SYNCOPA'TION, in Music. Notes which begin on the unaccented part of a measure, and end on the accented, are called syncopated or driving notes. Their effect is to invert the rhythm, and lay an emphasis on the usually unaccented part of the measure, e. g.:



SY'NCOPÉ. See FAINTING.

SY'NDIC (Gr. *syn*, with, and *diké*, justice), a name which has at different times and in different countries been given to various municipal and other officers. In Geneva, the chief magistrate was formerly called the syndic. The syndics of cities in France, under the old régime, were officers delegated by the municipality as agents or mandatories; the various trading companies in Paris and the university had also their syndics; and in the university of Cambridge the same name is applied to members of special committees of members of the senate, appointed by grace from time to time for specific duties. See UNIVERSITY.

SYNE'CDOCHÉ (Gr. literally an 'understanding one thing with another') is a term in rhetoric denoting that mode of expression by which a part is put for the whole, and *vice versâ;* as e. g., a door for a house, a sword for any weapon of war.

SYNE'RGISM (Gr. *synergeo*, to work together with), the name given to a doctrine of theology which teaches that in the work of conversion, the will of man is not wholly passive, but can co-operate, through consent, with the Divine Spirit. About 1557, the question was hotly discussed by the Protestant theologians, Pfeffinger, Flacius, and Strigel, and soon the whole theological world was wrangling over the point. The Wittenberg divines were in favour of, the Mansfeld divines against, synergism. Finally, the *Concordien formel*, in its third article, condemned it.

SYNGE'NESIA. See COMPOSITÆ.

SYNGNA'THIDÆ. See PIPE-FISH.

SY'NOD (Gr. and Lat., an assembly) in general signifies a meeting, but it is almost exclusively applied to ecclesiastical assemblies for the purpose of deliberating on doctrinal or disciplinary subjects. In church law, several kinds of synods—called also Councils (q. v.)—are enumerated: (1) ecumenical or general, of the entire church; (2) national—that is, of the church of an entire nation; (3) provincial—that is, of a province; (4) diocesan, or of a single diocese. Of these, the ecumenical council has been already described. Of the others, little explanation is needed beyond what is conveyed in the names themselves. By the law of the Roman Catholic Church, the decrees of a national or provincial synod must be submitted to the pope, and unless confirmed by him, or at least suffered to pass for two years without condemnation, are not held to have force. The diocesan synod is convened by the bishop, and consists of the members of the chapter, the beneficed clergy having the permanent care of souls, and the heads of the communities of regular clergy. Synods of the English Church are only held by the authority of the crown. A Presbyterian synod consists of only the ministers and elders within the particular district, generally one elder for each congregation. It is subordinate, however, to the General Assembly, when there is a General Assembly.

SYNO'DIC, the epithet applied to the period which elapses between a planet's appearance at one of the nodes of its orbit, and its return to the same node. See NODES and MONTH.

SY'NONYM. When any one of several words will serve to name or express the same thing, that thing is said to be *polyonymous*, or many-named, and the words are called *synonyms* (Gr. names together, or in company). In this wide sense, *man*, *soldier*, *general*, *Frenchman*, might be called synonyms, as they can all be applied to denote the same individual—e. g., Napoleon. See NOUN. But the term is commonly applied in a restricted sense to words having substantially the same meaning.

with only slight shades of difference—as *observe* and *remark*. In a settled and matured language, no two words can have exactly the same meaning; in such a case, one of them would be superfluous, and would be silently dropped. Words that were originally identical in application, have become differentiated by usage, each being appropriated to a special variety of the general notion.

The English language abounds in pairs of synonyms like *sharp* and *acute*, of which the one is Anglo-Saxon, the other borrowed from the Latin. It would be difficult to find a case of more exact correspondence of sense than *acutus* in Latin, and *sharp* (Ger. *scharf*) in Teutonic; but *acute* in English has become confined to the metaphorical sense of sharpness of the intellect or of the senses, the only case of its retaining the primary, physical signification being in the technical phrase, an 'acute angle.' *Sharp*, again, is applied both in the physical sense and also in the metaphorical; but metaphorical *sharpness* is not exactly the same thing as *acuteness*. A 'sharp' lad is one quick in apprehension and movement; an 'acute' intellect is one having great power of penetration and discrimination; while in a lawyer of 'sharp' practice, a reprehensible moral quality is implied.

SYNO'VIAL MEMBRANES AND FLUID. In every joint in which a considerable range of motion is required, the osseous segments (or contiguous extremities of bones) are separated by a space, which is called the cavity of the joint. The end of each of the bones entering into the composition of the joint is incrusted by a layer of articular cartilage adapted to its form, and the entire cavity of the joint is lined by a delicate membrane, which is termed the *synovial membrane*, which secretes a peculiar viscid matter, termed *synovia*, or *synovial fluid*, for the purpose of lubricating the inner surface. In its microscopical characters, a synovial membrane so closely resembles a serous membrane, that we shall content ourselves with referring the reader to the article on the latter structures. There are, however, certain points of difference, which are fully described in the article 'Serous and Synovial Membranes' in *The Cyclopædia of Anatomy and Physiology*. Like a serous membrane, a synovial membrane is always a closed bag, like the pleuræ, for example, with an attached and a free surface, the latter being smooth and moist. A very simple form of synovial membrane—anatomically known as a *bursa*—is employed to facilitate the gliding of a tendon of a muscle or of the integument over a projection of bone. It consists of a bag connected by areolar tissue with the neighbouring parts, and secreting a fluid in its interior. These bags are sometimes prolonged into *synovial sheaths*, which surround long tendons, such as those of the flexor and extensor muscles of the fingers and toes. In deep-seated Whitlow (q. v.), when inflammation extends to one of the sheaths, and gives rise to the formation of adhesions, the motion of the enclosed tendon is destroyed, and a permanently stiff finger is the result.

The *synovial fluid*, or *synovia*, derives its name from its resemblance to the white of an egg (Gr. *syn*, with, and *oön*, an egg). It consists of water, holding in solution mucin, albumen, extractive matters, fat, and inorganic salts. The analyses of Frerichs shew that the composition and quality of the synovia vary essentially according as an animal is at rest or leads a wandering life.

SY'NTAX (Gr. *taxis*, arrangement, *syn*, together) is the part of grammar that teaches the putting together of words for the expressing of thoughts; in other words, it treats of the construction of sentences. The first step is the analysis of sentences—the study of their anatomy and physiology, as it were (see SENTENCE). This important part of the subject is too often altogether overlooked. A clear perception of the mutual relations of the several members of a sentence makes the usual rules of syntax appear self-evident truths, and in most cases superfluous. Most of these rules fall under the heads of (1) Concord and Government, and (2) Order of Words, or Collocation. For details, we must refer to special works on the subject.

SY'NTHESIS (Gr. *synthĕsis*, making a whole out of parts) is a term employed in chemistry to designate the building up of a more or less complicated product from its elementary constituents. As the synthesis of inorganic compounds is usually very simple, we shall confine our remarks to organic compounds. To take a very common substance as an illustration, there is no difficulty in resolving sugar into its ultimate elements, or, in other words, in ascertaining its composition by analysis. If we heat a little sugar to redness in a glass tube, it leaves a black deposit, which is carbon, while a liquid, which is water, distils over; and on electrolysing this liquid, we resolve it into hydrogen and oxygen; so that we can thus shew that sugar is composed of the ultimate elements, carbon, hydrogen, and oxygen. An analysis of this kind shews that sugar may be represented by the formula $C_{12}H_{22}O_{11}$, and that one atom, or any given weight of it, contains 144 atoms or parts by weight of carbon, 22 of hydrogen, and 176 of oxygen. This pulling to pieces of the sugar is an easy matter, and has been known to chemists for more than half a century; but the putting together of the pieces, or, in other words, the synthesis of sugar, is a very much more difficult task. We may bring together carbon, hydrogen, and oxygen in the due proportions, and, to use the words of Professor Wanklyn (in a lecture delivered at the Royal Institution, February 12, 1864), 'we may shake them all together, or heat them, or cool them, and yet we shall never get them to combine so as to form sugar. Alcohol consists of 24 parts of carbon, 6 parts of hydrogen, and 16 parts of oxygen; but no alcohol ever results from making such a mixture. Neither sugar nor alcohol can exist at the temperature to which it is requisite to raise our mixture of carbon, hydrogen, and oxygen, in order to get chemical action to set in. At ordinary temperatures, the organic elements will not enter into combination, whilst at high temperatures they combine, it is true, but yield comparatively very few compounds.' There was a general belief that organic products, such as sugar, alcohol, urea, oxalic acid, taurine, leucine, &c., required for their production a mysterious so-called *vital force*, totally distinct from the ordinary forces acting on matter. The first blow to this now obsolete doctrine was struck by Wöhler in 1828, when he discovered that the organic base *urea* might be artificially obtained. See ORGANIC COMPOUNDS. Three years afterwards, Pelouze obtained *formic acid* from inorganic materials. In 1845, Kolbe, by a somewhat complicated process, effected the synthesis of *acetic acid*, and consequently, indirectly, of its derivatives, amongst which may be enumerated *acetone*, the product of the destructive distillation of acetates; *marsh gas*, obtained by distilling an acetate with a caustic alkali, and *ethylene;* and the electrolysis of acetic acid, which Kolbe accomplished a few years afterwards, yielded methyl and oxide of methyl, which latter could be transformed into any other methylic compound. During the last sixteen years, new and simpler methods have been suggested by various chemists, amongst whom Berthelot must be

especially mentioned, and enormous additions have been made to the list of so-called organic compounds which have been synthetically constructed. We shall give a description of the mode of producing alcohol synthetically, and shall then shew that from it, as a starting-point, an immense number of other organic compounds can be synthetically produced. To obtain this product synthetically, several distinct steps are necessary. The first is the formation of a transparent colourless gas, acetylene, C_2H_2, from carbon and hydrogen in the electric arc; by passing this gas through subchloride of copper, acetylide of copper is produced, which, in contact with nascent hydrogen, gives ethylene (olefiant-gas), C_2H_4; agitated with sulphuric acid, ethylene produces ethylsulphuric acid (sulphovinic), $(C_2H_5)HSO_4$ (discovered by Faraday and Hennell in 1820). On distilling this acid diluted with water, dilute alcohol comes over, which, on redistillation, in contact with quick-lime, yields pure *vinic or ordinary alcohol*, C_2H_6O. Having thus obtained ordinary alcohol from inorganic materials only, we may employ it to form by synthesis an immense number of other organic compounds. By means of what is known as 'the process of Mendius,' we can, as it were, step from one alcohol to the next above it. Thus, from ethylic alcohol (C_2H_6O) we obtain *propylic* (or *tritylic*) *alcohol* (C_3H_8O); from this we obtain *butylic* (or *tetrylic*) *alcohol* ($C_4H_{10}O$); from this, *amylic alcohol* ($C_5H_{12}O$), and so on. From the propylic alcohol thus obtained, we get by oxidation *propionic acid*, from which *lactic acid*, the acid of sour-milk, may be obtained; similarly, butylic alcohol yields butyric acid, every alcohol, in short, yielding a corresponding fatty acid by oxidation. *Glycerine*, the base of the fats, may also be obtained by a somewhat circuitous process. By combining glycerine with propionic acid, and with the other fatty acids which may be synthetically formed, we obtain several oils and fats similar to those which occur as natural products. The case of *taurine*, $C_2H_7NSO_3$, is even more striking; it is a product of various glandular metamorphoses, but its chief source is the bile, where it exists in conjugation with cholic acid as tauro-cholic acid. This highly complex substance can readily be formed in the laboratory from sulphuric acid, alcohol, and ammonia, each of which is capable of being built up from its constituent elements.

Sugar has been obtained by Berthelot from glycerine, a substance which is obtainable by purely inorganic means; but as he effected the conversion of the glycerine into sugar by the action of putrefying animal tissue, we can hardly regard the sugar thus formed as being of purely inorganic origin, although the animal tissue only acted catalytically, or as a ferment, and did not contribute any actual material to its formation. There is, however, no doubt that an unexceptional means of producing this important alimentary substance will soon be devised, since bodies strictly allied to sugar have been already obtained.* Another artificial compound of great interest in an industrial point of view, is *toluene*, C_7H_8, which has recently been obtained from phenyl, and which can itself be produced synthetically from alcohol. 'Starting,' says Dr Odling, 'from these two bodies, we may procure all the so-called coal-tar colours, with the brilliancy and variety of which most of us are now familiar. The red base or rosaniline, $C_{20}H_{19}N_3$, the violet base or triethylrosaniline, $C_{26}H_{31}N_3$, and the blue base or triphenylrosaniline, $C_{38}H_{31}N_3$, being producible in this way from their constituent elements, furnish admirable illustrations of the constructive powers of modern organic chemistry.'

We cannot conclude without adverting briefly to the possibility of economically replacing natural processes by artificial ones in the formation of organic compounds. On this subject, one of our most distinguished organic chemists, Dr Frankland, observes, that 'at present, the possibility of doing this only attains to probability in the case of rare and exceptional products of animal and vegetable life. By no processes at present known, could we produce sugar, glycerine, or alcohol from their elements at one hundred times their present cost, as obtained through the agency of vitality. But although our present prospects of rivalling vital processes in the economic production of staple organic compounds, such as those constituting the food of man, are exceedingly slight, yet it would be rash to pronounce their ultimate realisation impossible. It must be remembered that this branch of chemistry is as yet in its merest infancy; that it has hitherto attracted the attention of but few minds; and further, that many analogous substitutes of artificial for natural processes have been achieved.'

For further details on this subject, the reader is referred to Berthelot's *Chimie Organique fondée sur la Synthèse* (2 vols. Paris, 1860); to the same author's lectures on the *Leçons de Chimie professées en* 1860 *et* 1862; to various lectures by Wanklyn, Frankland, and others, delivered during the last two years at the Royal Institution; and to Odling's lectures *On Animal Chemistry*, delivered at the College of Physicians in 1865.

SYNTONIN, or **MUSCLE FIBRIN** (Gr. *synteinein*, to render tense), contains in 100 parts: carbon, 54·06; hydrogen, 7·28; nitrogen, 16·0?; oxygen, 21·50; and sulphur, 1·11. It is the principal constituent and the essential basis of all the contractile tissues. It may be obtained from muscular fibrin in the form of a coherent, elastic, snow-white mass; but whether it exists in the living body in a solid form or in solution, is undecided. Many recent physiological writers hold the latter view, and maintain that the phenomenon of cadaveric rigidity (*rigor mortis*) is due to its spontaneously coagulating after death.

SYPHILIS is, according to Dr Farr's system of nosological classification, to be regarded as belonging to the enthetic order of zymotic diseases (see NOSOLOGY and ZYMOTIC DISEASES). These diseases have the common property of being developed in the system after the introduction by inoculation or implantation of specific poisons. The poisons which produce diseases of this order may be introduced through any abraded cutaneous surface, or through mucous membranes, especially if any solution of continuity occurs. A morbid poison thus introduced into the system produces a specific effect both on the tissue at the place of insertion and on the blood, as soon as the poison begins to become absorbed; or, in other words, it produces both a constitutional and a local change. The absorbed virus seems to undergo the following changes in the living and infected body—viz. (1) Increase, (2) Transformation, and (3) Separation or Excretion. Taking our illustrations from the disease to which this article is specially devoted, the *increase* is shewn by the fact, that the pus from a single syphilitic sore may by inoculation be made to spread the disease a thousand-fold. The *transformation* is indicated by the successive phenomena which

* Carius, a trustworthy chemist, has announced that he has succeeded in forming *Phenose*, a kind of sugar, possessing all its chemical characteristics, from benzol. —*Ann. d. Chem. u. Pharm.*, December 1865.

supervene during the course of the disease. For example, syphilis is followed, as we shall presently shew, by a series of secondary and tertiary phenomena, which follow a tolerably uniform course in different patients. The *separation* or *excretion* of the poison may be accomplished in several ways. While in some of the more intense poisons—such as those of certain serpents—the whole mass of the blood seems rapidly affected, in others, as syphilis, 'a double process of the zymotic-like action seems to take place before the full effects which the poison is capable of producing are completed. The multiplication of the venereal poison, and its effects upon the system, seem to become developed during the existence of the hardening process which surrounds the infecting venereal sore. This is the first zymotic-like process, and is attended with a local papule, and perhaps an ulcer. From this local sore the system becomes contaminated, and in the blood a second process (of zymosis?) appears to be completed, by which the original poison becomes intensified, its pernicious influence more complete, and its specific, secondary, and tertiary effects are more fully developed.'—Aitken's *Science and Practice of Medicine*, 3d ed., vol. i. p. 666.

From this brief sketch of the nature of enthetic diseases, we turn to the consideration of the special disorder known as *syphilis*—a word whose origin is unknown. The terrible ravages of this disease amongst our soldiers and sailors, to say nothing of the fearful misery which it occasions in private life, afford more than sufficient apology for our introducing into these pages some of the most important details regarding this repulsive form of disease.* It is almost unnecessary to observe that syphilis is a contagious disease usually propagated by impure sexual intercourse. The following is a brief history of the course of the disease, if its progress is not checked by proper remedial agents. At an uncertain period, varying from three to ten days, after exposure to the infection, one or more venereal ulcers (commonly known as *chancres*) appear upon the generative organs. These ulcers present many varieties, which have been variously classified. The following arrangement, by Mr Henry Lee, Surgeon to the Lock Hospital, is an eminently practical one—viz. (1) The Hunterian or indurated or infecting chancre; (2) The non-indurated or suppurative chancre; (3) The ulcerative chancre; and (4) The sloughing chancre. These local affections are so different in their characters, and in their action on the constitution, that each must have a brief separate notice. (1) The *indurated*, or, as it is frequently termed, the *Hunterian chancre*, from its having been first accurately described by John Hunter, is the only one of these local affections that can be associated with constitutional syphilis. Its natural course is thus described by Mr Lee. 'At an uncertain period, but generally from three to four days after exposure to infection, attention may be drawn to the part by a slight itching. On examination, a red spot, surrounded by a little induration, will perhaps present itself, or a vesicle about the size of a millet-seed will not unfrequently form upon the infected part. The cuticle covering this vesicle is so thin that it usually gives way at a very early period; and this commonly happens before the disease has been carefully examined. The base of the vesicle then becomes indurated, and the induration (whether preceded or accompanied by a pimple or a vesicle, or independent of either of these) assumes a circular form, extending equally in every direction, and terminating quite abruptly in apparently healthy parts. A sore generally follows; this is excavated, without granulations, sometimes glazed, at other times having some adhesive matter on its surface. The colour of the chancre will depend often upon the amount and character of the substance which adheres to it, and will frequently present a fawn hue, or different shades of brown and red. When this adventitious matter is removed, the sore will usually again assume its original smooth and red glazed appearance.'—'Syphilis' in Holmes's *System of Surgery*, vol. i. p. 400. This variety of sore frequently gives rise to a chronic enlargement of one of the glands of the groin (forming what is termed a *bubo*), which does not involve the skin or the cellular membrane. It is followed by certain constitutional symptoms known as *secondary symptoms*, and requires, both in its primary and secondary forms, mercurial treatment. (2) The *suppurating chancre* usually begins as an abrasion, which, when fully developed, often presents the same appearance as if a piece of skin had been removed by a circular punch. The sore is covered with ill-formed granulations, and extending equally in all directions, maintains its circular form. After continuing three or four weeks, it generally heals, without leaving the hardness which is so characteristic of the Hunterian, infecting or indurated sore. Another important diagnostic difference is furnished by the microscopico-chemical examination of the fluid secreted by the sore. In this suppurating sore, the secretion consists of pus, which, on the addition of acetic acid, exhibits the characteristic compound nuclei; while in the infecting sore the secretion resembles turbid serum, presenting none of the characters of the pus. It does not give rise to bubo, nor is it followed by secondary symptoms. (3) The *ulcerative chancre* is a ragged worm-eaten ulceration; secreting an ill-formed pus, and presenting an irritable surface. Soon after the appearance of this sore, one of the glands of the groin will become enlarged and painful. This may be preceded by a shivering fit, more or less marked. The enlarged gland or bubo becomes very tender to pressure, and as the swelling increases, the skin becomes red, especially at the centre, and the general symptoms of suppuration present themselves. Great relief is afforded by the discharge of the pus. It is never followed by secondary symptoms, and, like the preceding form, requires only local treatment. (4) The *sloughing chancre* is fortunately rare in this country, but in many foreign ports, in warm and

* Dr Aitken observes that 'no statistical nosology gives any idea of the number of men lost to the public service from syphilis. The loss of strength from venereal diseases alone (gonorrhœa being included with syphilis in this term, and forming about 40 per cent. of the cases) is equal to the loss of more than eight days annually of every soldier in the service.' Dr Balfour in his *Medical, Sanitary, and Statistical Report of the Army Medical Department* for 1860, relates that 'more than one-third of all the admissions into hospital have been on account of venereal diseases (369 per 1000), and the average number constantly in hospital is equal to 23·69 per 1000 of strength (2315 men), each remaining in hospital on an average 23½ days. Thus the inefficiency is constantly equal to about 2½ regiments.' In 1861, these diseases caused a loss equal to 8·69 days for every soldier serving at home, there being a daily inefficiency of 2077 men; and the numbers are nearly the same for the succeeding years. The daily loss of service in the navy, in 1862, was about that of 586 men per day. How far these data apply to our civil population, it is hard to say; but it is much to be feared they apply pretty closely. 'It is a question,' says Dr Parkes, 'whether a large majority of the young men of the upper and middle class do not suffer in youth from some form of venereal disease. In the lower classes, it is perhaps equally common.'—*Practical Hygiene*, p. 453. For a comparison between the amount of venereal disease in our own and other armies, the reader may consult the same work, pp. 502, 503.

hot countries, this form of syphilis commits great ravages amongst our sailors, who have given to it certain characteristic names, such as the *black-pox*, the *black lion*, &c. It does not affect the inguinal glands, and is not followed by constitutional symptoms, and requires only local treatment.

Before noticing the constitutional or secondary symptoms which follow the Hunterian or infecting sore, we shall very briefly describe the treatment required for the last three forms, in which no constitutional symptoms occur. A suppurating sore should at once be thoroughly cauterised, so as to destroy all the tissues which have imbibed the poison. To secure this result, strong caustics are desirable; and as they sometimes extend further than is desired, an antidote should be at hand, which not only checks the further extension of the caustic, but deadens the pain. The agents most used in these cases are caustics and the mineral acids, and the *potassa cum calce*, a combination of potash and lime, which is prepared in the form of small rods for this purpose. The last of these is on the whole the best, as the extent to which it acts may be accurately regulated. When the action is sufficient, the application of a dilute acid will relieve the pain. Nitrate of silver, which is often employed, is not sufficiently energetic in its action to eradicate the disease. In the ulcerative sore, which is often irritable and painful, opium is useful both locally and internally. In other respects, the same treatment must be adopted as in the preceding variety. As the various means that have been suggested for preventing the suppuration of the bubo, which always accompanies this sore, are of no avail, it is useless to mention them. If, after the bubo has burst, the remains of an indolent, enlarged gland, incapable of forming healthy granulations, are left, caustic must be applied, so as to cause them to slough away. In sloughing sores, the great object is to check the destructive process; for which purpose, fomentations and poultices are applied locally, and large and repeated doses of opium are given internally. The nitric acid lotion, or a solution of potassio-tartrate of iron (10 grains to an ounce of water), is often an efficient local application in these cases.

We now return to the consideration of the Hunterian or indurated chancre, the only variety of venereal sore that gives rise to secondary or constitutional symptoms. If the patient seeks medical assistance as soon as he perceives the sore, it is possible that the application of a caustic will destroy the poison, and prevent any constitutional symptoms. If, however, four days or more elapse before treatment commences, the best local application is some form of mercury, as mercurial ointment spread on lint, or the application of black wash (see LOTIONS) steeped in the same material. When the poison has once entered the circulation, and become diffused throughout the body, it is desirable to neutralise it, if possible, before the appearance of any secondary symptoms. A very large number of drugs have at different times possessed an anti-syphilitic reputation, and a few are doubtless useful; as, for example, iodide of potassium. 'There is one medicine alone,' says Mr Henry Lee, one of the highest British authorities on the subject, 'which, through good report and evil report, in spite of the strongest prejudices of some against its use, and the no less adverse influence of others, who have employed it to an unjustifiable extent, has maintained its general reputation.'—*Op. cit.*, p. 418. In these remarks on the value of mercury (if judiciously given) we fully concur; but the mercurialists and non-mercurialists are almost equally divided. It may be given internally in pills or in solution; or it may be introduced into the system through the skin, in the form of ointment; or lastly, it may be employed in the form of vapour and thus applied to the skin. Of these three methods, none is equal to mercurial fumigation by calomel vapour, either in the readiness with which it removes the symptoms, or the slight disturbance it excites in the constitution, or in its certainty in preventing relapse. This process is a very simple one. A piece of brick must be heated to a dull red heat, and placed in a pan having a little water at the bottom. A quantity of calomel, varying from 10 to 20 grains, is placed on the top of the brick; and the patient then sits over the pan in a cane-bottomed chair, enveloped from his neck downwards in a large blanket.* The operation is best performed at bedtime; it is complete in a quarter of an hour; and when the patient is sufficiently cool to put on his night-shirt, he should go to bed without disturbing the calomel on the surface of the skin. It is almost impossible to produce salivation by this means of administering mercury; and all that is requisite is to produce a slight tenderness of the gums. The system must be kept under this gentle influence of the mercury till the induration in the primary sore has disappeared. At a period usually varying from one to two months after the first appearance of the induration (which is regarded by some writers as the first of the secondary symptoms), slight febrile symptoms, usually followed by an exanthematous eruption of the skin, often accompanied by sore throat, will occur. This eruption is a variety of *roseola;* it is of a rose-red colour, which disappears on pressure, and is not raised above the surface. It generally disappears in a few days, but if it persist, it will gradually change to a copper colour, which is characteristic of all syphilitic eruptions which remain for a considerable time without suppurating or ulcerating. The syphilitic eruptions which usually follow this primary rash may assume the varied forms of lichen, syphilitic tubercle, lepra, and psoriasis; and the best mode of treating them is by applying local mercurial fumigation, and at the same time giving iodide of potassium (in five-grain doses thrice a day) internally. Occasionally, in persons with impaired constitutions, syphilitic eruptions assume a pustular character. For a description of these eruptions, we must refer to Cazenave's *Manual of Diseases of the Skin*, translated by Burgess. Similarly, there are cases in which, from some constitutional peculiarity, or, as Mr Lee suggests, from some want of power in carrying out the natural processes of the disease, the syphilitic eruption may be accompanied by an effusion of serum only; or, in other words, may be of the vesicular type. Thus, we hear of syphilitic herpes, syphilitic eczema, &c. These forms must be treated as the others.

Amongst the secondary syphilitic diseases of the mucous membrane, may be especially noticed (1) mucous tubercles, (2) deep ulcer of the tonsils, and (3) syphilitic laryngitis. *Mucous tubercles* appear as small tense eminences inside the cheeks, on the arches of the palate, on the lips, on the generative organs, and on the rectum. A solution of corrosive sublimate applied locally (one or two grains to the ounce of water), or calomel, proves an effective local application. *Deep ulcer of the tonsils* is best treated by corrosive sublimate given internally, in doses of $\frac{1}{12}$th of a grain three times a day, in compound tincture of bark and water; and also used as gargle (in the proportion of 2 grains to a mixture of 7 ounces of

* A simple apparatus for mercurial fumigation, consisting of a kind of tin case containing a spirit-lamp, may be procured from Messrs Savigny and Co., St James' Street, by those who object to rough bricks and coarse pans. A special fumigating cloak, in place of the blanket, is sold with the apparatus.

water and 1 of honey). *Syphilitic ulceration of the larynx*, commonly known as *Syphilitic laryngitis*, is characterised by pain or tenderness in the region of the thyroid cartilage (see LARYNX), huskiness of the voice, a hacking cough from attempts to expectorate, with occasional expulsion of purulent matter mixed with blood. If the disease is not checked, enervation, night-sweats, and dangerous exhaustion, ensue, and life is often terminated by suffocation.

In noticing the secondary symptoms, *syphilitic iritis* must not be overlooked; its symptoms and treatment are described in the article IRITIS.

Our limited space precludes more than a very brief allusion to the more important *tertiary syphilitic affections*. The most important of these are those which attack the bones and their coverings. They may be included under the heads of acute and chronic periostitis (the latter being very common), nodes and exostosis, inflammation of bone, caries and necrosis; next to these are tertiary affections of the skin and mucous membrane, which consist mainly of intractable ulcerations attacking the face (especially the nose and lips), nails, ears, and mucous membranes of the various openings of the body; and diseases of the glands. In many of these cases, a modified form of mercurial fumigation is most useful; but if mercury, even in this form, is thought inexpedient, in consequence of the general debility of the system, iodide of potassium, combined with any of the preparations of sarsaparilla, may be employed. Bark, iron, and the mineral acids are also of service in restoring the strength; and opium, by relieving the nocturnal pains which are so frequently present, will also prove most useful. The reader who wishes to pursue this subject further, may be referred to Aitken's *Science and Practice of Medicine*, in which he will find an account of the tertiary syphilitic affections of the nails, heart, brain, lungs, liver, and tongue.

The SYPHILIS OF CHILDREN is a subject which must not be omitted in an article on this disease. If the constitution of either the father or mother of an infant is saturated with the syphilitic poison, the child may be born with certain symptoms indicating that it is suffering from *congenital syphilis*. Moreover, the child of a mother having a primary sore, but no constitutional symptoms, may be inoculated with syphilis during the act of delivery; or the disease may be communicated in vaccination (if the matter be derived from an impure source); or by contact with syphilitic sores on the persons of wet-nurses or others. All these cases are included in the *infantile* variety of the disease. One of the most striking symptoms of true congenital syphilis is that which is popularly known as the *Snuffles*, in which a discharge collects in the nose, and sometimes blocks it up so completely that the infant is unable to suck for any length of time. The skin presents an eruption of spots, which are usually somewhat coppery, but sometimes of a rose-red tint; while on the soles of the feet and the palms of the hands, the cuticle scales off, and an appearance like that of psoriasis is presented; and flat mucous tubercles occur at the parts where the skin and mucous membrane merge into one another. White ulcers of a crescentic form often occur in the mouth; and with these symptoms there is nearly always observed 'the wizened and shrunken look, the anxious expression, and the dirty hue of the skin (a kind of dirty greenish yellow), which imparts to the infant a peculiarly repulsive aspect of old age.'—Holmes, 'On the Surgical Diseases of Childhood;' *op. cit.*, vol. iv. p. 830. Congenital syphilis frequently causes the death of the fœtus at about the fourth or fifth month; and if a woman is repeatedly delivered of dead children from the fourth to the seventh month, the practitioner may fairly conclude that a syphilitic taint is *probably* present. In other cases, the child is born alive with the 'snuffling' and eruption; but in the majority of cases, the infant when born is apparently healthy, and the disease does not shew itself till about six weeks after birth.

When congenital syphilis is diagnosed with certainty, the medical attendant has a very important duty to perform, from which he must not shrink from any feelings of delicacy. He must discover which of the parents is affected, and must prohibit further cohabitation until the secondary symptoms have been completely removed by the treatment which has already been described. 'Neglect of this precaution,' says Mr Holmes, in his excellent memoir on Congenital Syphilis (contained in the 4th vol. of his *System of Surgery*), 'may not only entail on the couple the misery of a family of deformed, puny, and ailing children, but to the woman at least is fraught with grave personal danger. Whatever may be the case amongst the poor, there is no doubt that, in the better classes, congenital syphilis is usually derived from the father, the mother being unaffected except through the fœtus.' There is scarcely a doubt that a woman carrying a syphilitic fœtus may become thus infected with secondary syphilis by the exchange of fœtal and maternal blood in the placenta; and this explains how it is that women who have never had the primary infecting sore, occasionally shew all the symptoms of secondary syphilis after living for some years with husbands similarly affected.

Allusion has already been made to the fact, that *infantile* (not *congenital*) syphilis may be communicated by vaccination. There is undoubted evidence that in the year 1861, in a thinly populated district of Piedmont, in which syphilis is virtually unknown, 46 children of various ages were simultaneously attacked with syphilis proceeding from chancres in the arm, and followed by buboes (enlarged glands) in the armpits; and that all these children had been vaccinated directly or indirectly from a single child, who was subsequently proved to have contracted syphilis from a wet-nurse; and further, that these children transmitted the same disease to a number of women, their wet-nurses, mothers, &c., and even to children who nursed and played with them; that the women so infected communicated the disease to their husbands; and finally, that the disease yielded in all cases to the ordinary treatment adopted in syphilis. This, as Mr Holmes observes, is by far the most convincing instance of the propagation of syphilis by vaccination; but several others are recorded by Mr Lee (*Lectures on Syphilitic Inoculation*, 1863) and other writers.

Cases in which the nipple of the wet-nurse has been infected by a syphilitic infant are by no means rare, and have in various instances given rise to litigation.

Congenital syphilis and infantile syphilis generally must be treated with mercury—either in the form of inunction, by keeping a flannel band, smeared twice a day with mercurial ointment, in constant contact with the thigh or arm for about six weeks; or internally, by the careful use of Gray Powder (*Hydrarg. c. cretâ*), in doses of a grain and a half or two grains, twice a day; combined with a little compound chalk-powder, if any irritation of the bowels occurs. The snuffles will be relieved by syringing the nostrils with lukewarm water, and then introducing a couple of drops of almond or olive oil.

In a foot-note to an early paragraph of this article, we gave abundant evidence of the appalling

prevalence of this disease. In his valuable treatise on *Practical Hygiene*, Dr Parkes discusses the question of the prevention of this disease amongst soldiers; as, however, his remarks for the most part are applicable to other classes, we shall briefly notice them. The means of prevention which he discusses are—1. *Continence*, which is promoted by (*a*) The cultivation of a religious feeling and of pure thought and conversation; (*b*) The removal from temptation and occasions to sin; (*c*) Constant and agreeable employment, bodily and mentally; and (*d*) Temperance. 2. *Early marriages*. At present, only six per cent. of the soldiers of the British army are allowed to marry. 3. *Precautions after the risk of contagion*. In some French towns, the use of lotions and washing is rigorously enforced, with the effect of lessening disease considerably. 4. *Cure of the disease in those affected by it*. Health-inspections, in special reference to venereal diseases, are made weekly in the British army by the surgeon or assistant-surgeon; and although similar inspections of all recognised prostitutes have long been made by legal authority in many parts of the continent, no attempt at legal interference with the disease in women was made in England till 1864, when the 'Contagious Diseases Bill' was passed, by which, in the neighbourhood of certain places (Portsmouth, Plymouth, Woolwich, Chatham, Sheerness, and Aldershot), prostitutes who are found diseased may be taken to a hospital, and there detained till cured. A committee appointed by the British government to report upon the best means of checking the disease in the army and navy, made a report in Feb. 1866, and issued their recommendations; the most important of which are—(1) The periodic inspection of all known prostitutes in the garrison towns placed under the provisions of the act of 1864; (2) the appointment of a surgeon vested with the necessary powers; (3) punishment for infringement of the act; (4) the extension of its operation to all garrison and seaport towns used by troops or ships; (5) the prohibition of the residence of public women in beer-shops; (6) that the lock hospitals be placed under government control; and lastly, that the police supervision of the women in the streets of such towns be more stringent. The evidence taken by this committee unquestionably proved that the working of the act of 1864 was decidedly useful, although its application was so limited. For an account of the various plans which are adopted on the continent for the prevention of this disease—such as the registration of brothels and of prostitutes, and the enforcement of periodic examinations at short intervals—the reader is referred to the various works of Parent-Duchatelet, Acton, Sanger, and others on Prostitution; and to two articles on the same subject by Dr Holland (of Cork) in the *British and Foreign Medico-chirurgical Review* for 1852.

Without entering into any prolonged details regarding the history of this disease, we may briefly mention that, towards the close of the 15th c., a great epidemic of syphilis pervaded Europe, and that it was supposed to have been imported from the New World; and that, in the 16th c., syphilis was recognised as the result of a specific virus. During last century, the history of this disease is divisible into three distinct periods, in each of which very different views have been prevalent. These may be described as—1. *The Period and Doctrine of Hunter*, who believed that the various forms of syphilis and gonorrhœa depend upon one and the same poison—a view taught by Carmichael in Dublin, Cazenave in Paris, and others. 2. *The Period and Doctrine of Ricord*, who proved that gonorrhœa was quite distinct from syphilis, and that inoculation with gonorrhœal matter will not cause a chancre; and that there are *two* classes of chancres, the *soft* and *hard*, originating from the same source. 3. *The Present Period*, commencing in 1856, in which it is held that, exclusive of gonorrhœa, there are *two* forms of the syphilitic poison. It has been judiciously advised by Mr Longmore, the Professor of Military Surgery in the Army Medical School, that in accordance with our present knowledge of this disease, the term *syphilis* or *syphilitic* should be restricted to such cases as are believed to be of a specific infecting kind, while the term *local venereal sore*, or *venereal ulceration*, should be applied to those cases which require merely local treatment, and are not followed by constitutional symptoms.

SYPHILISA'TION is the term used to designate an operation which has the double object of eradicating syphilis already existing in the system, and of securing permanent immunity from any future attacks, by means of repeated inoculations of syphilitic poison. As long ago as the year 1844, a French physician, Auzias Turenne, undertook a number of experiments, with the view of testing whether John Hunter's view, that syphilis could not be communicated to the lower animals, was correct. After some failures, he succeeded in producing venereal sores (chancres) in monkeys, by inoculating them with the human virus; and he found that rabbits cats, and horses might be similarly infected from the chancres of the monkey. He likewise found that the chancres produced by inoculation became less and less in each animal, until a period at length arrived at which the poison seemed to have lost all its power, and no further sores could be produced; and he was thus led to believe, that by prolonged inoculation, the system became protected. The subject was next taken up by Sperino of Turin, who inoculated patients suffering from syphilis by virus from a chancre, and repeated the inoculation once or twice a week, till the poison—as in the case of Turenne's animals—ceased to produce any effect; and when this point was reached, all the other sores had healed. In 1851, Professor Boeck of Christiania, when travelling through Italy, had his attention drawn to the doctrine of syphilisation; and from that time to the present, he has devoted himself unremittingly to it, and is now the great authority on the subject. He believes that syphilisation is the proper mode of treating syphilis in all its stages, and that—to use his own words—'in no disease have we a more certain method of cure. During the summer of 1865 Dr Boeck visited London, and took active steps to make his views on the subject accurately known in England, and the surgeons of the Lock Hospital admitted a series of cases to his mode of treatment; and Mr James Lane, one of the surgeons to that institution, in a discussion (February 1866) on this subject at the Harveian Society, observed, that 'if syphilisation would do what its advocates professed it would, we should have a remedy which, although undoubtedly severe in its operation, would do its work without any injurious effect on the system, and we should thus escape, in a very great measure, if not entirely, from all the more serious effects of the disease. Hitherto, as far as he had seen, it had effected everything which had been promised for it. The progress of the cases in the Lock Hospital had in almost every detail corresponded to the predictions of Professor Boeck respecting them. In several of those who had been longest under treatment, immunity from inoculation with primary syphilitic matter had been arrived at.' As almost all the speakers both at this meeting and at a late meeting of the London Medical Society

at which the same subject was discussed, spoke in favour of the system in so far as they had yet personally seen its effects, and advocated its further trial, there can be no doubt that if syphilisation has the claims upon our notice which Dr Boeck maintains, these claims must be soon universally recognised by the medical profession.

SY'RA (anc. *Syros*), the most important, though not the largest member of that group of islands in the Ægean Sea known as the Cyclades (see GREECE), lies 13 miles south of Andros. It is about 10 miles long by 5 broad, bare, hilly, and not very fertile. The products are wine, some wheat, barley, figs, honey, and vegetables; but the greater portion even of the common necessaries of life have to be imported from Greece and foreign countries. Its prosperity is of quite modern growth. During the War of Independence, S. remained neutral, and, in consequence, numerous fugitives flocked thither from other parts of Greece, especially from Chios and Psara, who, besides adding largely to the population, brought with them a spirit of political activity and commercial enterprise, the beneficial effects of which are now strikingly visible. Pop. 35,000. The capital, *Syra*, or *Hermopolis*, is situated on a bay on the east side of the island. It rises terrace-wise from the shore, is well built, and is the seat of government for the Cyclades, and the residence of foreign consuls. It has numerous educational institutions, 4 printing-presses, and 3 weekly newspapers. S. has become the great commercial entrepôt of the Ægean. Nearly one-half of all the imports of Greece reach it through this port. It builds more ships than any other town in the Levant, and owns one-third of all the Greek merchantmen. It has likewise regular steam-communication with all the principal trading-towns in the Levant. Pop. of the town of S. 20,000.

Ancient notices of S. are scanty. Homer praises it in the *Odyssey* as 'rich in pastures, in herds, in wine, in wheat;' but it has no history.

SY'RACUSE, anciently the most famous and powerful city of Sicily, situated on the south-eastern coast of the island, 80 miles south-south-west of Messina, was founded by a body of Corinthian settlers under Archias, one of the Bacchiadæ, 734 B.C. The original colonists seem at first to have occupied nothing more than the little isle of Ortygia, about one mile long, and half a mile broad, which lies near the shore. It rapidly rose to prosperity, and was enabled to establish sub-colonies of its own: Acræ (664 B.C.), Casmenæ (644 B.C.), and Camarina (599 B.C.). Nothing definite is known of the early political state of S.; but before 486 the political power had passed into the hands of a few leading families, or perhaps *clans*, who constituted an oligarchy, while the great body of the citizens formed a malcontent democracy. In that year a revolution took place. The oligarchic families—*Geomori* or *Gamori*, 'landowners;' probably the descendants of the original colonists, like the patrician *gentes* of Rome—were expelled, and the sovereign power was transferred to the citizens at large. Before a year passed, however, Gelon (q. v.), 'despot' of Gela, had restored the exiles, and at the same time made himself master of Syracuse. He was a great ruler, and under him the city increased in size and wealth. It is believed to have been in Gelon's time that the adjoining mainland was first built upon. The locality of the new settlers was the slopes and heights of Achradina, or the 'outer city,' a triangular table-land north of the island of Ortygia, and subsequently connected with it by a mole. It ultimately became the most extensive and populous quarter of S.—contained the Agora, a temple of *Zeus Olympios*, the Prytaneum, with a splendid statue of Sappho, the fine monuments to Timoleon and the elder Dionysius (q. v.), &c. It may be convenient to mention here the other two quarters of the city, especially as the date of their settlement is not known. These were Tyche—so called, according to Cicero, from an ancient temple of 'Fortune' erected there—occupying a plateau to the west of Achradina; and Neapolis (New City), stretching along the southern slopes of the plateau, and overlooking the marshes of the Anapus and the 'Great Harbour,' a spacious and well-sheltered bay, about five miles in circumference. Neapolis became one of the finest parts of Syracuse. Here were situated the theatre, amphitheatre, and numerous temples, of which hardly a relic remains, except of the first mentioned. Ortygia contained the castle or citadel which immediately fronted the mainland, and overlooked the docks or *navalia* in the 'Lesser Harbour.'

Reverting to the history of S., which we must touch upon only in the most cursory manner, a noticeable characteristic of the reign of Hiero (q. v.), the successor of Gelon, is his cultivation of the fine arts, and his liberal patronage of men of genius, as Æschylus, Pindar, &c. In 466 B.C., the democracy again got the upper hand—Thrasybulus, a 'tyrant' of the baser sort, being expelled; and for sixty years a free and popular government was enjoyed, under which S. flourished more than it had ever done. During this period occurred its great struggle with Athens (415—414 B.C.), in which it came off victorious, and its renown at once spread over the whole Greek world. But a new power appeared on the stage—the Carthaginian, whose conquests in Sicily, towards the close of the 5th c., threatened the supremacy of Syracuse. Meanwhile, Dionysius (q. v.) restored the 'tyranny' of Gelon, and during a reign of 38 years greatly increased the strength and importance of the city. It was he who constructed the docks in the Greater and Lesser Harbours, and surrounded the city with fortifications. His fierce and victorious war with Carthage (397 B.C.) raised the renown of S. still higher. The reigns of the younger Dionysius (q. v.) and of Dion were unsettled; but after the restoration of public liberty by Timoleon (344 B.C.), a brief season of tranquillity ensued, during which the prosperity of the city rapidly revived. Under Agathocles, however, the despotic form of government was again established (317 B.C.), and continued, with scarcely an interruption, down to the conquest of the city by the Romans (212 B.C.) during the Hannibalic war—the ruler of S., Hieronymus, a rash and vain young man, having abandoned the prudent policy of his grandfather, Hiero (q. v.), broken the alliance with Rome, and joined the Carthaginians.

Under the Romans, S. slowly but surely declined, though it always continued to be the capital and first city of Sicily. Captured, pillaged, and burned by the Saracens (878 A.D.), it sunk into complete decay, and is at present confined to its original limits, Ortygia, which, however, is no longer an island, but a peninsula. Pop. 19,400. The streets of the modern town are, with few exceptions, narrow and dirty. S. has a cathedral, a museum of classical antiquities discovered in S. and the neighbourhood, a public library, with some curious MSS., numerous churches, monasteries and nunneries, and carries on a trade chiefly with Malta in wine, oil, salt, and salt-fish. It has several remains of ancient and medieval edifices, which are much visited by travellers.

SYRACUSE, a city of Central New York, U. S. at the head of Onondaga Lake on the Erie Canal,

and at the junction of the New York Central and Oswego railways, 148 miles west-by-north of Albany. It contains a handsome court-house, state arsenal, state asylum for idiots, 37 churches, 3 daily, 10 weekly, and 2 semi-weekly newspapers, 13 banks, 18 public schools, and several libraries. Here are the largest salt works in America, which produced, in 1870, 8,748,113 bushels of salt; 5 iron furnaces, 14 machine-shops, manufactories of silver- and tin-ware, sheet-iron, coach- and wagon-factories, and breweries. Pop. in 1860, 28,199; 1870, 43,051; 1880, 51,791.

SY'RIA (Arab. *E'sham*, Turk. *Soristan*), a division of Asiatic Turkey, bounded on the N. by portions of Asia Minor, on the W. by the Levant, and on the S. by Arabia Petræa; on the E. and S.-E., its boundary is rendered indefinite, in great part, by the sands of the desert, but at length becomes fixed by the course of the Euphrates. It is divided into three governments: 1. That of Saïda (subdivided into 9 *livas*); 2. Scham (subdivided into 5 *livas*); and 3. Haleb (subdivided into 3 *livas*). Area estimated at about 146,000 sq. m.; pop. about 2,750,000. The whole region is traversed by a double mountain-chain—of which Lebanon (q. v.) forms the highest part—touching in its northern extremities the Alma Dagh (anc. *Mons Amanus*), and in its southern forming the Sinaitic range. The central part of this mountain-system, which in many places exhibits the characteristics of a plateau, presents on the west a steep front towards the Mediterranean, but on the east rolls gradually away into the level uplands of the Syrian wilderness. The most noticeable features of the long *furrow* between the double ridge, beginning at its southern end, the Gulf of Akaba, are, the waterless wady of Arabah, the narrow, deep-sunken region known as *El Ghur*, through which the river Jordan flows, and which embraces the Dead Sea and the Sea of Galilee, and the vale of Cœle-Syria (q. v.), and its great continuation northwards, watered by the Nahr-el-Asy (anc. *Orontes*). The western ridge is broken through in three places: in the north by the lower Orontes; in the middle near Tripolis—where the chain of Lebanon properly terminates—and further south, near Tyre, by the Leontes. South of Tyre, it recommences in the hill-country of Western Palestine (q. v.), which finally passes into the desert plateau of El Tyh, in the Sinaitic peninsula. The eastern ridge is less sharply defined; its most conspicuous elevations being Anti-Libanos, the mountains of Moab (east of the Dead Sea), and Mount Seir, overlooking the wady Arabah. The principal rivers are the Orontes (q. v.), the Leontes, the Jordan (q. v.), the Barada or Abana, the river of Damascus. The only lakes worth mentioning are the Dead Sea (q. v.) and the Sea of Galilee.

Although S. belongs to the countries comprised within the Asiatic rain-zone, yet in general the climate is excessively dry and hot, differing little from that of Arabia. Drought and scantiness of vegetation characterise almost equally the uplands and the valleys. Only where the mountains are lofty, the streams abundant, and the atmosphere somewhat maritime, as in the terraced slopes of Lebanon, do we find some approach to tropical luxuriance in flower, and fruit, and tree. Forests of evergreens, beautiful grassy pastures, and meadow-tracts are found there; and wheat, maize, rice, &c., are largely produced. The cultivation of the vine, the cotton-tree, the mulberry, and also the finer sorts of fruits, as the olive and fig, is considerable, while indigo and sugar-cane are raised in the valleys of the Jordan and the regions round about the Dead Sea. The fauna of S., like its climate and vegetation, is similar to that of Arabia. The camel is of almost as much importance as further south; and the Syrian deserts, particularly towards the north, are the home of gazelles, hyænas, jackals, bears, buffaloes, and other wild animals.

The greater part of the Syrian mountains is limestone; mountain limestone in Lebanon, chalk in Anti-Lebanon, and Jura limestone in Palestine. In the last of these, volcanic formations occur, especially in the region of the Jordan and the Dead Sea, where hot springs, beds of bitumen and sulphur, the shapes of the hills, and the frequent earthquakes, afford unmistakable evidence of volcanic activity. Salt is the only mineral of much consequence, and is exported in considerable quantities; coal, however, is worked near Beirût. Sheep, goats with hanging ears and silky hair, cattle, mules, and asses, form, as in ancient times, a great part of the wealth of the inhabitants.

Silk is the chief article of manufacture—at Aleppo, Beirût, Damascus, &c.—but cotton and woollen fabrics, gold and silver thread-stuffs, glass, earthenware, leather, soap, &c., are also manufactured in different parts of the country. The want of roads is a great hindrance to the development of industrial activity. Up to 1863, there was not a single carriage-road in the whole of Syria. In that year, one was opened between Beirût and Damascus. The other roads are mere mule and camel tracks. In 1862, S. exported grains, seeds, cotton, galls, wool, &c., to the value of £126,242; and imported cottons, woollens, copper, tin, iron, coals, indigo, pepper, coffee, &c., to the value of £603,513.

The *religious* sects of S. are numerous. Most of the people are Mohammedans; but Christians of the Greek Church number 350,000; Maronites (q. v.) and Roman Catholics, 260,000; Jews, 175,000; Druses (q. v.), 48,000; lesser sects about 17,000. The inhabitants are in some sense a mixed people, for the country has experienced many political vicissitudes; but by far the greatest number, whether Christians or Mohammedans, are of Shemitic origin, either Phœnician, Aramæan, or Arabic. Their Turkish rulers, however, and such Turkomans and Kurds as we find settled in the north of S., belong to the Turanian race. Arabic is everywhere spoken, and may be considered the national language, since the old Syriac or Aramaic tongue is wholly dead, except among the Nestorians of Kurdistan.

The *history* of S. stretches far back into remote antiquity. In the time of Abraham (2000 B. C.), Damascus was a city; in the oldest literature of Greece, Sidon figures as the capital of a rich, populous, and civilised state; and in the Hebrew Scriptures, Canaan or Palestine is crowded with towns at the period of its conquest by Joshua; but, like most other so-called nations in early times, S. did not form a single state; it was rather a congeries of independent states whose inhabitants belonged to the same race. Every important city had its king, whose normal occupation was fighting with his neighbours. Under David and Solomon, something like political unity was achieved; yet it does not appear that these great rulers dispossessed of their territories the princes whom they subdued, but only made them tributary, and after their death things reverted to their previous condition. Rezin, a slave, then made himself master of Damascus, and extended the Damascene monarchy over all Northern and Central S.; but the conquests of Tiglath-Pileser resulted in its becoming a province of the Assyrian Empire. Subsequently, the whole land, including Palestine, became part of the successive empires of Babylonia, Media, Persia, and Macedonia. Then followed the dynasty of the Seleucidæ (q. v.). After their fall, S. passed into the hands of the Romans,

who retained it, though not continuously — for on several occasions the Persian Sassanidæ (q. v.) managed to wrest it from them—until the Arab conquest (7 c. A. D.). During the Crusades (q. v.) of the middle ages, several Christian principalities were established here, but endured only for a short period. S. now became a possession of the sultans of Egypt, in whose time it was frightfully devastated by the Mongols. In the 16th c., it was conquered by the Turks, and has ever since formed part of the Turkish Empire.

SY'RIAC VERSIONS. Apart from the Peshito (q. v.), there were other Syriac versions of the Old Testament current among the Syrian Christians, although they did not acquire canonicity among them. These were chiefly translated from the LXX., and the best known among them is one drawn up from the text of the Hexapla (q. v.; compare also ORIGEN), which it follows most slavishly, without any regard for Syriac idiom or grammar. It contains the critical marks of Origen, and is moreover furnished with numerous variants, fragments from other Greek versions, and exegetical scholia. Bishop Paulus of Tela is supposed to have composed it at the instigation of Bishop Athanasius, 617 A.D. There are now only a few (imperfect) MSS. extant of it—one in Paris, one in the Ambrosian Library (a third, once in the possession of T. Masius, has disappeared), and further portions are found in the Nitrian collection in the British Museum. The greater part of the Biblical books has been edited from it, but in separate publications. A complete edition is still a desideratum. An attempt is now being made towards a more complete edition of the Hexapla itself by a reconstruction of lost portions of the Greek, through the medium of the parallel Syriac passages preserved in this translation. Two other MSS. in the Paris Library contain fragments of another Græco-Syriac version, by Jacob, Bishop of Edessa, who, in 703 and 704 A.D., composed it from the Peshito and the above translation, which is probably to be understood in the sense of his having made a new recension of Paulus of Tela's work, corrected after the Peshito.

SYRIAN RITE, CHURCH OF, that portion of the oriental church which had its seat in Syria, and which was anciently comprehended in the patriarchate of Antioch, and (after that of Jerusalem obtained a distinct jurisdiction) in the patriarchate of Jerusalem. The Syrian Church of the early centuries was exceedingly flourishing. Before the end of the 4th c., it numbered 119 distinct sees, with a Christian population of several millions. The first blow to the prosperity of the Syrian Church was the fatal division which arose from the controversies on the incarnation. See MONOPHYSITES, NESTORIANS, EUTYCHES, JACOBITES. The Eutychian heresy, in one or other of its forms, obtained wide extension in Syria; and the usual results of division ensued in the corruption and decay of true religion. The Moslem conquest accelerated the ruin thus begun; and from the 7th c. downwards, this once flourishing church declined into a weak and spiritless community, whose chief seat was in the mountains, and whose best security from oppression lay in the belief on the part of the conquerors of their utterly fallen and contemptible condition. Under the head MARONITES has been detailed the most remarkable incident in the later history of the Syrian Church. This branch of the eastern Christianity, although for the most part divided from the orthodox Greek Church by the profession of monophytism, took part with the Greeks in their separation from the west, under Michael Cerularius; and the reunion of the Maronites to Rome had the remarkable result of establishing side by side, within the narrow limits occupied by the Christians under the Moslem rule in Syria, two distinct communities, speaking the same language, using the same liturgy, and following the same rites; and yet subject to two different patriarchs, and mutually regarding each other as heretics and apostates from the ancient creed of their country.

The chief peculiarity of the Syrian rite, as contradistinguished from the Greek, consists in its liturgy, and the language of that liturgy, which is Syriac, and with which the people, and in many cases the priests, are entirely unacquainted. The liturgy is known as the Liturgy of St James. The Syrians agree with the Greeks in the use of leavened bread, in administering communion under both heads, in permitting the marriage of priests (provided they marry before ordination), and in administering the unction of confirmation at the same time with baptism, even to infants.

The Christian community of Syria may at present be divided into four classes: the Maronites, the Greeks (who are also called Melchites), the Monophysites, who are called Jacobites, and the primitive Syrian Christians (not Maronites), who are in communion with Rome. This last-named community forms the small remnant of the ancient Syrian Church, which remained orthodox during the controversy on the Incarnation, at the time of the general lapse into Monophytism. To these are to be added the Christians of the Latin rite. The Maronites number about 150,000; the Greeks are said to be about 50,000; the Jacobites of Syria and of Armenia Proper are said to reckon together about 40,000 families, of whom, however, but a small proportion (probably scarcely 10,000 in all) can be set down to the account of the Syrian Church. The non-Maronite Syrians who follow their national rite, but are in communion with Rome, are supposed to amount to about 4000. The resident Latins are chiefly members of the religious orders who from immemorial time possess convents in the Holy Land, and European Catholics, who have settled permanently, or for a time, at Jerusalem, Beirût, and Damascus. None of these can in any way be regarded as belonging to the Syrian Church. It may be well to add, that the belief, and in most particulars the disciplinary practice of these several classes coincide substantially with those respectively of the same communities in the other churches of the East. All (with the exception of the Maronites and the few United Syrians, reject the supremacy of the Roman see. The Syrians of the Greek communion reject the double precession of the Holy Ghost; and the Jacobites firmly maintain their old tenet of Eutychianism. Among them all are to be found monks and religious females. All enforce celibacy on their bishops, and refuse to priests the privilege of contracting a second marriage, or of marrying after ordination. The practice of fasting prevails among all alike. They receive and practise the invocation of saints and prayers for the dead, and the use of painted, although not of graven images. Many particulars regarding them are to be gleaned from the memoirs of recent missionaries of the several denominations, among which the letters published from time to time by the French Society for the Propagation of the Faith, although naturally tinged with some sectarian colouring, are particularly full and interesting.

SY'RINGE (Gr. *syrinx*, a pipe,), a hydraulic instrument, consisting of a cylinder of metal or glass, having a conical nozzle at one end, and the other fitted with an air-tight piston. The nozzle being inserted in a liquid, the retraction of the piston draws the liquid into the cylinder, on the principle of the Pump (q. v.), and by its forward

pressure the liquid is expelled from the nozzle in the form of a jet.

SYRRHA'PTES, a genus of birds of the Grouse family (*Tetraonidæ*), of which only one species is known (*S. Pallasii*), a native of the deserts of Tartary, abundant in the neighbourhood of Lake Baikal. From its peculiar characters, which led Pallas to call it *Tetrao paradoxus*, it has received the somewhat pedantic name of *Heteroclite Grouse*. (A word is called *heteroclite* by grammarians which departs from the ordinary forms of declension.) The legs and toes are short, and densely feathered; and the toes are joined together for the greater part of their length. The bird walks with difficulty, but flies very well, although in general only for short distances. The wings and tail are very long, terminating in remarkably long, slender, pointed plumes.

SY'RTIS MA'JOR AND SYRTIS MI'NOR, the ancient name of two gulfs of the Mediterranean Sea, on the north coast of Africa. The former (now called the *Gulf of Sidra*) lies between Cape Mesurata, in Tripoli, and the table-lands of Barca, and forms the most southern part of the Mediterranean. The latter (now called the *Gulf of Cabes*) lies to the north-west, between Tunis and Tripoli. The shores of both are inhospitable, and abound in quicksands, which, carried by the wind, are said by the ancients to have frequently overwhelmed ships, and the reports of modern travellers to some extent confirm these old traditions. Their waters are (or were) dangerous to sailors, on account of the shallows, sandbanks, and sunken rocks that abound in them.—The name Syrtis is derived from an Arabic word *Sert*, meaning a desert.

SY'RUP. *Syrup*, *sherbet*, and *shrub* are all derived from the Arabic *srb;* the first through the Latin, the second through the Persian, and the third through the Hindu. Syrup, in its simplest meaning, is a saturated solution of sugar boiled to prevent fermentation; but it also means the juice of fruits saturated with sugar and many flavoured liquids, treated in the same way. Generally speaking, the finest refined sugar is used; and every effort is made to get the syrup very clear and free from all feculent matter. Syrups of fruits are much used on the continent to mingle with water for drink, and are very wholesome. They are also used in Britain, but not much, except in medicine—there being many medicinal syrups.

SY'STYLE, an arrangement of classic columns in which the intercolumniation is equal to twice the diameter of the column.

SYZRA'N, a town of Central Russia, in the government of Simbirsk, on the right bank of the Volga, about 150 miles below the town of Simbirsk. It owes its foundation to its advantageous commercial position on the Volga, and in the middle of a district teeming with agricultural produce. From the wharfs of S., 150 vessels, laden with corn, are annually despatched to Rybinsk and St Petersburg. Pop. 20,525.

SZATHMA'R-NEME'THY, a town of Hungary, on the Samos, 60 miles north-east of Debreczin. Pop. 14,288.

SZE-CHUE'N (Four Streams), a vast province of Western China, and the largest of the eighteen. It has an area four times greater than that of England, but the population is scanty. The Kincha-kiang, or 'Golden Sanded River,' which rises in the southern slopes of the great Tibetan range, flows through S., and after receiving several tributaries, it becomes, before leaving the province, the famous Yang-tze-kiang. In its course, it passes at right angles, and by narrow gorges, through a succession of ranges of hills, which have a direction from north to south. The people of S. cannot always force a subsistence from their stubborn soil. Famines are not uncommon, when whole families are starved to death, and thousands subsist on a mixture of rice, roots, and common earth. Coal is abundant, but of inferior quality; seams of from three to five feet in thickness are laid bare in the gorges cut by the Yang-tze, and gold is found in small quantities, grains of the precious metal being brought by the Kincha river from the mountains of Tibet.

SZEGEDI'N, the second largest town in Hungary, is situated on the right bank of the Theiss, at the point where it is joined by the Maros, 118 miles south-east of Pesth by railway. S. is fortified, and has some fine buildings. It manufactures great quantities of soda, tobacco, coarse cloth, &c., has the largest wharfs on the Theiss, and carries on an extensive river-trade in wood and corn with Transylvania and the Banat. Most of the Turkish cotton imported into Austria passes through Szegedin. Its markets rank next to those of Pesth and Debreczin. Pop. 69,041.

SZEGSZA'RD, a town of Hungary, near the right bank of the Danube, 80 miles south-south-west of Pesth. Here excellent red wine is made. Pop. 10,500.

SZE'NTA. See ZENTA.

SZENTE'S, a market-town of Hungary, 30 miles north of Szegedin, near the left bank of the Theiss. The *commune* contains 26,000 inhabitants, who are chiefly engaged in the wine-culture.

SZOLNO'K, a town of Hungary, on the Theiss, 66 miles east-south-east of Pesth. It contains important salt-magazines, and is the centre of the traffic by steamers on the Theiss, and an important railway station. Pop. 13,936.

T

T THE twentieth letter of the English alphabet, is the sharp or mute of the lingual series *t*, *d*, *th* (*dh*). The name in Shemitic, where it stands last in the alphabet (*Tau*), signifies a mark (in the form of a cross). The Shemitic tongues had another *t*-sound, which became the Greek *θ* (*th*). This aspirated *t* is wanting in Latin and its derivatives; it is also foreign to High-German, although the Gothic and other Low-German tongues (English) possess it. The Gothic *th* has become in High-German *d*. In the *spelling* of High-German, *th* occurs not unfrequently; but it is never pronounced, and the introduction of it being considered by students of the language an aberration, there is a tendency to drop the *h*. There is evidence that in Latin, at an early period, *t* before *i* was sibilated so as to sound like *ts* or *z*. See letter C. Before *s*, *t* was frequently dropped; as *fons* for *fonts*, *sors* for *sorts*. Final *t* was in Latin pronounced but faintly, and inscriptions shew that in popular speech it was often dropped; e. g., *fece* for *fecit*, *vixse* for *vixit*. Thus the modern Romanic languages have inherited the loss of the pronominal ending *t* from their common mother. In French, *t* between two vowels has been elided; as *père*, *mère*, from *pater*, *mater*. In the corresponding words of the allied languages, *t* is often interchanged with other letters. T in Sanscrit, Greek, and Latin becomes *th* in Gothic and English, and *d* in High-German; thus Lat. *tres* (Sans. *trayas*), Goth. *thrais*, Eng. *three*, Ger. *drei;* Lat. *tectum* (Gr. *tegos*), Goth. *thak*, Eng. *thatch* or *thack*, Ger. *dach;* Lat. *frater*, Goth. *brothar*, Eng. *brother*, Ger. *bruder*. In German, the *t* of the English is often represented by *z*, as Eng. *two* = Ger. *zwei;* Eng. *toll* = Ger. *zoll;* while German *t* or *th* becomes Eng. *d*, as Ger. *tag*, *thau* = Eng. *day*, *dew*. A more remarkable interchange is seen in Lat. *lacrima* = Eng. *tear*. See PHILOLOGY.

TABA'NIDÆ, a numerous family of Dipterous insects, of the section *Proboscideæ*, which live by sucking the blood of horses, oxen, and other animals, and are popularly known by the name of GAD-FLY, which, however, is often given also to some of the *Œstridæ* (see BOT). The insects called CLEG (q. v.) are of this family. The proboscis is exserted, and is generally terminated by two lips; the palpi are also exserted; the antennæ are three-jointed, the third joint consisting of a number of rings. The T. fly with a buzzing noise. They are very annoying to cattle in the end of spring and early part of summer; and where they abound, the skins of cattle are often streaked with blood from their bites. The LARGE GAD-FLY (*T. bovinus*) is more common in some parts of the continent of Europe than anywhere in Britain, and is rarer in Scotland than in England. But the British T. are numerous. The species are widely distributed. Some of them

Gad-fly and larva (*Tabanus bovinus*).

inhabit the deserts of Arabia and Africa, and attack camels in prodigious numbers.

TA'BARD (Fr. *tabarre*, from *tabardum*, Low Lat.), a military garment in general use in the latter half of the 15th and beginning of the 16th c., which succeeded the *Jupon* and *Cyclas*. It fitted closely to the body, was open at the sides, had wide sleeves or flaps reaching to the elbow, and displayed the armorial ensigns of the wearer on the back and front, as well as on the sleeves. About the middle of the 16th c., the tabard ceased to be used except by the officers of arms, who have down to the present time continued to wear tabards embroidered with the arms of the sovereign.

TABASHEE'R, a substance sometimes found in the cavities or tubular parts of the stems of bamboos and other large grasses. It consists chiefly of silica, with a little lime and vegetable matter, or sometimes of silica and potash, in the proportions of about 70 parts of silica and 30 of potash. It appears to be formed by extravasation of the juices of the plant, in consequence of some diseased condition of the nodes or joints. It is in high repute among the Hindus as a tonic, and is prepared by imperfect calcination and trituration. The powder is often chewed with betel, in order to renovate the constitution. There are several varieties of tabasheer, one of which, of very rare occurrence, is extremely beautiful, of a delicate azure colour by reflected light, and of a faint yellowish hue by transmitted light, easily crushed between the fingers, and of 'an aërial and unsubstantial texture, which we look for in vain in any other solid.' Other varieties are yellowish, white, and much like some varieties of opal. Tabasheer is very porous, and absorbs water and oil very rapidly; effervescence taking place when it is plunged in water. By absorption of oil, the opaque varieties become transparent. When the greater part of the oil is expelled by heat, the

structure of the tabasheer becomes apparent; it is beautifully veined, the veins being sometimes parallel, and sometimes curved. The optical properties of tabasheer are remarkable. Of all known substances, it has the lowest refractive power.

TABBY, or TABBYING, another name for watering fabrics. See MOIRE. It is usually applied to stuffs or worsted cloths instead of silks.

TA'BERNACLE (Heb. *Ohel Moed* = tent of meeting, *scil.*, between God and man; LXX. *Skene*, Vulg. *Tabernaculum Fœderis*), or, more fully, 'Tabernacle of the Congregation,' was the tent first erected by Moses in the desert as a visible symbol of the Divine Presence in the midst of the people. It was the place where he went to receive his inspirations as their representative, when they 'came to seek Jehovah.' A cloudy pillar descended and stood at the door of the Tabernacle while 'the Lord spake to Moses.' The detailed description of the Tabernacle contained in Ex. xxv. seqq., xxxvi. seqq., renders more than a brief outline superfluous in this place. Suffice it to mention that it was divided into the 'Sanctuary' proper—which formed the front part, and the dimensions of which were 20 cubits in length, 10 in width, and 10 in height—and the 'Holy of Holies,' which was 10 cubits square, and 10 high. A kind of court-yard, formed by curtains suspended between columns, ran round the Tabernacle, 100 cubits long, and 50 wide. The entrance was towards the east—the rising of the sun—and closed by another costly curtain, into which, like unto the first covering, figures of 'cherubim' were woven. The surrounding court was much larger on this eastern than on the western side, for here it was that the people assembled for the purpose of worship. Here also stood the altar, made of acacia-wood, upon which a perpetual fire was kept burning, and the brazen laver. The *Sanctuary* contained the gilded table with the shewbread to the right, the golden candlestick with the seven branches to the left, and between both the 'golden altar,' or the 'altar of incense,' upon which the high-priest burned incense in the morning and evening. In the Holy of Holies, the holy ark, or Ark of the Covenant, alone was kept: a box of acacia-wood, plated with pure gold both in and outside, containing the two tables of the Ten Commandments. On the top of it were the two cherubim, their faces turned towards each other; and between them there was the symbolical presence of Jehovah (the Shechinah), to which Moses appealed for guidance.

Only once a year, on the Day of Atonement, the high-priest was allowed to enter the Holy of Holies, while the Sanctuary was the ordinary place of the priests, and the court that of the Levites. The tribe of Levi was also that to which the place nearest to the Tabernacle, around which the twelve tribes were grouped, was assigned, as it also was the duty of its members to convey the building from place to place during the migrations.

The Tabernacle, after the people had settled in Canaan, was erected at Shiloh, where it was still found at the time of Saul, although the Ark of the Covenant itself had been carried away by the Philistines, in the time of Eli, and when restored, placed at Kirjath-jearim. Nor was the Tabernacle of Shiloh the only sanctuary, as it was intended to be. We find other local sanctuaries with priests—at Bethel, Nob, Sichem, Mizpah, &c.—at which even Samuel worshipped, as in legally instituted places. When David is reported to have removed the Ark from Kirjath-jearim to Jerusalem, nothing is said about the Tabernacle of Shiloh; on the contrary, David erected a new one on purpose for the Ark. It seems probable that it was removed at some time or other from Shiloh to Nob, and thence to Gibeon, from whence Solomon seems to have fetched it away, with all its vessels, thus putting an end to the double worship that under David had divided the faithful between Gibeon, where Zadok officiated, and Jerusalem, with Asaph's worship. Nothing is further known of the Tabernacle, which, besides being a symbol of God's presence, had also served the purpose of a visible political and religious link between the tribes. As a safeguard against idolatry and unlimited sacrificial worship, however, it did not prove effective enough.

TABERNACLE (Lat. *tabernaculum, armarium*), in the Roman Catholic Church, is the name given to the receptacle in which the consecrated elements of the Eucharist are retained. The name is derived by analogy from the tabernacle of the Old Law, and in form the Roman Catholic tabernacle bears a general resemblance to the Jewish original. By the present discipline, the tabernacle is commonly a small structure of marble, metal, or wood, placed at the posterior part of the altar, and of costly material and workmanship. Even when the exterior structure is of marble or metal, there is commonly an inner receptacle of wood (properly cedar), lined with silk. The tabernacle is appropriated exclusively to the reservation of the Eucharist, and it is prohibited to keep within it any other object, however sacred, as the chrism, relics of saints, the altar-vessels, &c. A lamp is constantly kept burning before the tabernacle, which is ordered to be kept at all times carefully locked, the key being retained by the clergy, to whom it is forbidden to intrust it to any lay person, even the sacristan or other official of the church.

TABERNACLE, FEAST OF (Heb. *Succoth*, LXX. *Heorte skenon*, Vulg. *Feriæ Tabernaculorum*), a Hebrew feast of seven days' duration, beginning on the fifteenth day of the seventh month (Tishri), and instituted principally in memory of the nomad life of the people in the desert, and the booths or tents used on their march. Besides this signification, it also had an agricultural one, like the other two pilgrimage festivals, the Passah and the Feast of Weeks. It was emphatically the Feast of 'Ingathering'—i. e., the close of the labours of the field —the harvest of all the fruits, of the corn, the wine, and the oil. During this feast, the great bulk of the people were enjoined to dwell in booths, which we learn from Nehemiah viii. 15, were made of olive, pine, myrtle, palm, and other branches, and were erected on the roofs of houses, and in the courts and streets. The scriptural injunction, to take trees and 'boughs of goodly branches of palm-trees,' &c., was by tradition explained to mean a bunch made of palm, myrtle, and willow branches, and the esog-fruit, a species of citron, which the faithful carried in procession during these seven days in the Temple; while those who did not visit the Temple only said a benediction over it on the first day. The Sadducees and Karaites, however, demurred to this explanation, taking the passage merely to refer to the construction of the booths. Special sacrifices, and a greater number of burnt-offerings than on any other festival, were offered up on this; and on it also the law was to be read to the people every seventh year. It was emphatically called *the* festival, and was the most joyous of them all. There was especially, during the time of the Temple, the 'joy of the libation,' consisting of the priest's fetching, during the morning sacrifice of each day, water from the well of Siloah, and pouring it out, with the accompaniment of music and hymns. There was further a grand illumination in the evening in the court of women, which is said to have lighted up

the whole city of Jerusalem; and during and after which, dancing and singing took place. On each day the trumpets were sounded 21 times. At the end of the seven days' joy, an eighth day of solemn rest was celebrated, which was perfectly distinct from the other days both in its sacrifices and in its general service. The bunch was laid aside, the booths were relinquished, and a sin-offering—in expiation of transgressions that might have taken place during the hilarity of the previous feast-days —was slaughtered.

Three distinct times we find the inauguration of the Temple celebrated on this important festival, by Solomon, Ezra, and Judas Maccabæus, although with regard to the festival itself, it would seem from Nehemiah viii. 17, that it never had been properly celebrated before the Exile. The observances of the booths and the harvest-bunches are still in force with the strict adherents of traditional Judaism, although the agricultural signification of the festival to them can only be a historical or poetical reminiscence. It has been well observed of old, that no festival could have been more apt to inculcate the fundamental principle of Judaism—viz., the equality of all men, than this, which enjoined that every one should live for a time in primitive dwellings, without distinction of rank, or station, or fortune, and should rejoice in the fruits of the last harvest on the hallowed spot, together with the whole people of the land, 'before the Lord.'

TABE'RNÆMONTA'NA. See COW-TREE and FORBIDDEN FRUIT.

TA'BES DORSA'LIS is a term that was formerly used in medicine to designate a series of morbid phenomena, arising from excessive exercise or abuse of the generative functions. Subsequently, it has been used by some writers of eminence as synonymous with *Tabes mesenterica*, or mesenteric disease. Romberg, in his *Manual of the Nervous Diseases of Man*, translated from the German by Dr Sieveking, under the auspices of the Sydenham Society, applies the term to a diseased condition of the spinal cord, giving rise to a diminution or loss of the continuance and vigour of motion and sensation. The first symptom is loss of power of the muscles of the legs, the patient complaining of weakness and inability to perform any movement, or endure any position for a continuance. The sense of touch and the muscular sense are soon found to be diminished. The feet feel numb, and the patient has a sensation as if they were covered with fur. The following symptom is characteristic of this affection. If the patient is ordered to close his eyes while in the erect position, he at once begins to totter and swing from side to side, and it is quite impossible for him to step boldly and firmly forward; he will reel and tumble like a drunken man. The loss of power, after a time, extends to the sphincter muscles. As the disease progresses, the loss of power extends to the arms, the sphincter of the bladder becomes completely paralysed, and the virile powers become extinct. Paralysis of the muscles of the eyeball often comes on comparatively early in this case, and occasions squinting, double vision, and other distressing symptoms. Towards the close of the disease, the patient becomes utterly incapable of holding himself erect or moving; the urine and fæces pass off involuntarily; and bed-sores, terminating in gangrene, often precede death.

The duration of this disease is from six months to ten or fifteen years, but it is often shortened by the intervention of phthisis. It is a disease of middle age, and is for the most part restricted to males.

The disease is one of so hopeless a character that it is almost unnecessary to say anything regarding treatment. Duchenne, who has recently described the disease under the name of *Ataxie locomotrice progressive*, recommends *localised electricity* in the form known as 'Faradisation,' which consists in the employment of the electricity of the induced or secondary current in the helix round the magnet. It should be practised at least three times a week for from five to ten minutes each time, and continued for a month at least.—For the best and fullest account of this disease, the reader is referred to Trousseau's *Lectures on Clinical Medicine*, translated by P. Victor Bazire, M.D., Part i. (Lond. 1866).

TABINE'T, a rich kind of cloth, chiefly used for window-curtains. It consists of a warp of silk and a weft of wool-yarn, of the same kind as that used in making poplin. It has the appearance of a fine damask, and is usually enriched with diaper patterns.

TABLEAUX VIVANTS (i.e., Living Pictures), representations of works of painting and sculpture, or of scenes from history or fiction, by living persons. They are said to have been invented by Madame de Genlis, when she had charge of the education of the children of the Duke of Orleans. They have long been common in theatres, and have more recently become an amusement of private circles. In an æsthetic point of view, they are of no value whatever, but rather are of injurious influence, and contrary to just principles of taste.

TABLE-LANDS, or PLATEAUX, are extensive plains at a considerable elevation above the sea, whose boundaries are either ranges of mountains much higher on the side away from, than on the side next to, the table-lands; or steep acclivities, sloping from the level of the plateaux to the surrounding country. They are often traversed by mountain chains, and occasionally even lose the character of plains altogether, being mere conglomerations of hills. The chief table-lands are—in Europe, Central Spain; in America, the territories of the plains, the great salt plain of Utah, and the north and centre of Brazil; in Africa, the interior of Barbary; while in Asia, almost the whole of the south and centre of the continent consists of plateaux, which rise terrace above terrace till they culminate in that of Tibet. Of the Asiatic plateaux, the principal are: that of Asia Minor (3280 feet above sea-level), Armenia (7000 feet), Persia or Iran (3000 feet), Mysore (4000—5000 feet), Deccan (1500—2000 feet), Tibet (12,000—17,000 feet), and Chinese Tartary (3000—4300 feet). These table-lands are generally accounted for by the supposition of a more extensive and uniform action of the upheaving force than that which produced mountains; and satisfactory indications of the former action being quite recent, and long subsequent to the latter, are occasionally discovered.

TABLE-MONEY is an allowance granted to general-officers in the army, and flag-officers in the British navy, to enable them to fulfil the duties of hospitality within their respective commands. It varies according to the locality or importance of the appointment, £3, 3s. a day being the maximum, except under very unusual circumstances.

TABLE MOUNT. See CAPE TOWN.

TABLES, LUNAR, are tabular lists of the values of the elements of the moon's orbit, as planetary tables are those of the elements of the planets' paths; but the term is also occasionally employed to denote the tabulated angular distances of the moon from certain stars at fixed epochs, as given in the *Nautical Almanac* (q. v.). See LATITUDE.

TABLE-TURNING. See ANIMAL MAGNETISM; SPIRITUALISM.

TA'BOR, a celebrated mountain of Northern Palestine, rising solitarily in the north-eastern part of the plain of Esdraëlon, to about the height of 1000 feet, and commanding the most extensive and probably the most magnificent prospect in the Holy Land. Eastward, the eye catches a gleam of the waters of the Galilean Sea, 15 miles distant; while the whole picturesque outline of its deep-sunken basin, of the rolling trans-Jordanic plateau, and the course of the sacred river itself, is clearly traceable; westward, stretch away into the dim horizon the rich plains of Galilee, rising up into the dark-green ridges of Carmel, overhanging the Levant; on the north and north-east, the snow-covered heights of Hermon (see LEBANON) glitter pale over the intervening hills; while to the south, the view embraces the fatal heights of Gilboa and the confused landscapes of Samaria. T. itself is at present thickly clad with forests of oak, pistacias, &c., the haunt of wolves, wild-boars, lynxes, and various kinds of reptiles. Its beauty alone would be sufficient to insure it distinguished mention among the mountains of Palestine, but it owes its celebrity even more to its having been regarded from an early period as the Mount of Transfiguration. This opinion, however, is now all but universally abandoned, as there is strong evidence of its summit having been then occupied by a city; and travellers are disposed to look for the scene of this supernatural incident further north, in the neighbourhood of Hermon. In the times of the Crusaders, T. was studded with churches and monasteries, relics of which, as well as of Roman and Saracenic structures, still remain.

TA'BORITES (a sect of the Hussites in Bohemia) derived their name from their fortress of Tabor, near the river Luschnitz, an affluent of the Moldau, 49 miles south-south-east of Prague. There is now a small town at the place, which has a pop. of 4300, and carries on some woollen manufactures, &c.—The first leader of the T. was John Ziska (q. v.) of Trocynow. Under him was Nicolas von Hussinecz, who repelled the imperial army from Tabor in 1420. The Calixtines, desirous of the peace of the country, offered the throne of Bohemia first to King Ladislas of Poland, then to the Grand Duke Witold of Lithuania, and afterwards to his brother Coributt. Ziska refused his consent, and thus these parties became completely separated. In the years 1420 and 1421, both of them set forth their creed in a number of articles. The T. absolutely rejected all ordinances of the church not expressly appointed in the Holy Scriptures. Both parties were united by common danger in opposition to a common enemy. In 1422, Ziska defeated the Imperialists at Deutschbrot, and thereafter with uninterrupted success in a number of minor conflicts; and in 1424, Prague was saved from destruction only by submitting to hard terms of peace. After Ziska's death, Procop (q. v.) the Greater, or Procop Rasa (the Shaver), and Procop the Less were their leaders. In 1427 and in 1431, they gained great victories at Miess and Tachau over the mercenary crusaders of the German Empire, and till 1432 their incursions were the dread of the neighbouring countries. The Council of Basel, finding them still unconquered in 1433, proceeded to treat with them; and the Calixtines entered into an arrangement, known as the *Prague Compact*, which, however, was despised by the T. and the Orphans, as that section of the T. who considered Ziska as irreplaceable, had come to be termed. The T. and Orphans were completely defeated at Böhmischbrot on May 30, 1434, by the now united forces of the Roman Catholics and the Calixtines. In the treaty of Iglau, in 1436, the Emperor Sigismund confirmed the compact, and promised religious and political liberty. The civil war, however, continued till King Ladislas in the Diet at Kuttenberg, in 1485, established a religious peace, securing both Roman Catholics and Calixtines in their possessions. The T. were eventually lost in the sect of Bohemian Brethren (q. v.) which arose from amongst them.

TA'BOUR, a small drum, played with one stick in combination with a fife. It was formerly used in war, but has now given place to the kettle-drum.

TABRI'Z (pronounced and frequently written *Tabreez*), a great and ancient city of Persia, capital of the province of Azerbijan, 40 miles east of Lake Urumiah, and on the Aji, which flows south-west into that lake. The town is surrounded by a ditch and a brick wall, pierced by 7 gates. It forms an oblong of gardens and houses, 2¼ miles long; stands 4000 feet above sea-level, but nevertheless has the appearance of being shut in by mountains. The streets are broader and cleaner than in most eastern cities, but they are flanked as usual by the pits from which the earth required for their houses was taken; the houses are infested with noxious insects; and the bazaars are roofed with sticks, and are dark and dirty. Water, however, is comparatively plentiful. The chief buildings of T. are not specially striking. Perhaps the principal architectural feature of the town is the fine ruin, Kabûd Masjid, or 'blue mosque,' about 300 years old, and in part covered with blue tiles beautifully arabesqued. The citadel is a noble edifice of burned brick, the walls of which, however, have been cracked in many places by earthquakes. T. is the seat of a varied industry, in which leather and silk manufactures and gold and silver smith's work alone are of importance; recently it has also become the emporium of an extensive trade, the exact value of which, however, is not known, owing to the careless manner in which the custom-house officials transact their business, and to the prevalence of smuggling. Merchandise, to the value of £400,000, is exported through the regular channels from T. to Russia; but it is estimated that, in 1859, a quantity of equal value was conveyed to that country by smugglers. Since 1859, this illicit traffic has very much diminished, although it still exists along the whole Russo-Persian frontier of Azerbijan. Silk is by far the most important article of export; in 1862, it amounted to 851,925 lbs., value about £393,778. The principal imports are cotton fabrics, dyed, printed, white, and gray, and mostly from English looms, value, in 1862—1863, £815,000; refined sugar, £150,000, chiefly from Holland and France; woollen cloths from Germany, Belgium, and France, and teas (value £42,000). There is little prospect, in the meantime, of any improvement in English commerce at this town.

T., the ancient *Tauris*, became the capital of Tiridates III., king of Armenia, in 297 A.D., and was probably at that time an old city. In 791 A.D., it was enlarged and greatly embellished by Zobaidah, the wife of Harûn-al-Rashid. In 858, and again in 1041, the city was devastated by an earthquake. It was taken and sacked by Timur in 1392, and was soon after seized by the Turkomans, from whom it was taken by the Persians in 1500. In 1721, it was again visited by a dreadful earthquake, and on this occasion 80,000 persons are said to have perished. It has been several times in the hands of the Turks, but was finally taken from them by Nadir Shah in 1730. T. is a city of Turks, and Turkish is the language spoken. Pop. variously estimated at 150,000—200,000.—Eastwick's *Three Years' Residence in Persia* (Lond. 1864), and *commercial Reports from Her Majesty's Consuls* (1864).

TA'BU, TAPU, or TAMBU, a Polynesian term, denoting an institution found everywhere, and always essentially the same, in the Polynesian islands and in New Zealand. Its primary meanings seem to be exactly the same as those of the Hebrew *to'ēbah.* This word, like the Greek *anathema*, the Latin *sacer*, and the French *sacre* (and the corresponding and similar terms in most languages), has a double meaning—a good sense and a bad; it signifies on the one hand, sacred, consecrated; on the other hand, accursed, abominable, unholy. It results from a thing being held sacred, that certain acts are forbidden with reference to it, and from any act being deemed abominable, that it is forbidden; a notion of prohibition thus attaches to the word tabu, and this is, in many cases, the most prominent notion connected with it. The term is often used substantively in the sense of a prohibition, a prohibitory commandment. If a burial-ground has been consecrated, it is tabu; to fight in it is then an act sacrilegious and prohibited, and this also is tabu; moreover, those persons are tabu who have violated its sanctity by fighting in it, and they are, loosely and popularly, said to have broken the tabu. This example illustrates all the uses of the word. It has furnished to the English language the now familiar phrase of being 'tabooed' = forbidden.

The extent to which, among the Polynesians and New Zealanders, things and acts are tabu, must appear almost incredible to Europeans unaware of the facts of savage life. Without much detail, it is impossible to convey any idea of it. The prohibitions, however, divide into two classes: one consisting of traditional rules, binding upon all, acting through religious terror equally upon chiefs and people; the other, of prohibitions imposed from time to time, obviously with the view of maintaining or extending the authority of the chiefs. Those of the first class are by far the most remarkable. Of the most important of them—those bearing upon what are called sacred things, those relating to the person of the chief, and those relating to intercourse between relatives—a few examples may be given.

Any house or piece of ground consecrated to a god is tabu; and thus affords an inviolable shelter to men fleeing from an enemy. *A fortiori*, all temples are tabu. To sit upon or to touch the threshold of a temple, is tabu to all except chiefs of the first order; the lesser chiefs may stride over the threshold, but common persons pass over it on their hands and knees. It is tabu to eat the plant or animal believed to be the shrine of one's tutelary god. To come in the way of a funeral procession is severely tabu, for it is believed that the gods accompany the procession; if any person were to disregard the warning chant of the mourners, they would rush at him and put him to death. Again, to touch the person of a chief, is tabu to his inferiors; also, to touch anything belonging to him, to eat in his presence, to eat anything he has touched, or to mention his name. And a chief's threshold is as sacred as that of a temple, and must be passed over in the same manner. It is strictly tabu to touch a dead chief or anything which belonged to him, or any of the clothes or utensils employed in his interment; even those employed in laying out the body pay the penalty of infringing this prohibition. The interdict upon family intercourse varies in extent in different places. In the Tonga Islands, it was tabu to mention the name of father, mother, father-in-law, mother-in-law; also to touch these relatives, to eat in their presence (unless with the back turned, when constructively the person was not in their presence), or to eat anything which they had touched. In the Fiji Islands, generally, it is tabu for brother and sister, first-cousins, father-in-law and son-in-law mother-in-law and daughter-in-law, brother-in-law and sister-in-law, to speak together, or to eat from the same dish. Husband and wife, too, are forbidden to eat from the same dish. In some places, a father may not speak to his son after he has passed his 15th year. In an immense number of cases, equally extraordinary, the tabu is used to enforce the prevailing ideas of social propriety. It interferes with cooking, eating, dressing, speaking: scarcely anything is too minute to be regulated by it.

The traditional tabu also supplies to some extent the place of laws and a police. In many places, exposed property of some kinds is always under its shelter. In some cases, it appears to have been worked in the interest of the priests; thus, certain foods—for example, turtle—are always tabu, and cannot be eaten until a portion has been set aside for the gods. There is a purely superstitious use of it, too, in relation to common things, as when a canoe is made tabu that it may go more safely.

The chiefs have a large discretionary power of declaring articles or actions tabu; indeed, their power is unlimited, but they are expected to keep within precedent. In many cases, they use it for purely public purposes—thus, when a feast is coming on, they lay a tabu upon pigs and nuts, and other articles, that there may be abundance for the feast. And when a scarcity of anything is apprehended, they place a temporary tabu on its use. Speaking generally, any article of food—fish, flesh, fowl, grain, or fruit—may be rendered tabu. A coast, a river, a hunting-ground, may be declared tabu; and then there is an end of fishing, and sailing, and hunting, until the chief has withdrawn the prohibition. The tabu is obviously a powerful instrument of government; and the chiefs are very adroit in using it for their own advantage.

When a man has accidentally infringed the tabu against touching a chief, or a relative, or things immediately connected with him, he is freed from the state of tabu by a ceremony called *moë-moë;* this consists in pressing, first the palms, then the back of the hands, to a superior chief's foot, and afterwards washing the hands with water. If a man has accidentally eaten food which a relative or chief has left, he goes through a ceremony called *Fota*, which consists in pressing a superior chief's foot against the stomach. Any breach of the laws relating to sacred places, must be atoned for by sacrificing to the offended god. A person, when he is tabu, must not use his hands in feeding himself or in working; were he to feed himself, it is believed that he would die; he must be fed by others until the tabu is removed. In many cases, the tabu can only be removed by time. Thus, a common person, who has touched a dead chief, remains tabu for ten lunar months; a chief for four or five months, more or less, according to the deceased's superiority over him. In several cases, breach of tabu is punished with death; in many, it involves a sort of outlawry—the neighbours of the offender being free to carry off or to destroy his goods.

It is obvious that the effect of breaking a tabu—at anyrate, one effect of it—is to produce uncleanness. The offender has done something unholy, accursed; his hands are not clean; if he has not sinned in the last degree, he must make atonement or undergo purification. The chief, holding a divinely appointed rank, recognised as a semi-divine person, descended from the gods, is the medium of purification; he has authority to loose as well as to bind. The offence consists in a thing having been done displeasing to the supernatural powers, for which, it is believed, they will not fail to take vengeance. It is not, in the general case, an offence against any particular

god; nor is the punishment of it looked for from one god more than from another. Tabu is certainly older than most of the Polynesian gods; it must have existed for ages before the mythologies took their present shapes; it might have existed before any name for god had become current. It has no connection with fetishism. The Polynesians do not worship natural objects; their belief that certain plants and animals are the shrines of gods, would naturally lead to the worship of those; but in fact, they merely do not eat the plant or animal which is the shrine of their tutelary god. And though this is enforced by a tabu, the tabu is evidently distinct from the belief in the god's connection with the plant or animal; it is only the means of enforcing that belief—being the customary means used to prevent any act which would provoke a god to anger. The origin of tabu seems to be a vague fear of superhuman powers; this has become associated with certain things and acts: thus practically, tabu is a system of divinely appointed restraints—religion, in the primary sense of the word. The religious horror has attached itself—or, through the policy of priests and rulers, has become attached—to every prohibition supported by a strong expediency; which it is apt to do among rude peoples, especially where the prohibition relates to the family, or to the relation of tribesmen to their chief. It must have been through a long process of construction, carried on by the governing classes—the chiefs and the priests—that tabu became the system it now is. The extensive political application of tabu is sufficient evidence that the Polynesian chiefs have been adepts in the art of turning the religious feelings of their countrymen to their own account.

TACAHOUT is the name given, in Algiers, by the Arabs to the small gall formed on the Tamarisk tree, *Tamariscus Indica.* Since the discovery of photography, these galls have become of considerable importance as a source of gallic acid, of which they contain a large proportion. The French chemists import considerable quantities; and the same gall, under the name of Mahee, is imported for the same purpose by British chemists from India.

TA'CAMAHAC, or **TACAMAHA'CA**, a name which, from the number of its applications, has produced considerable confusion in the history of commercial products. No less than four different resins are known under this designation. One, from Mauritius, is obtained from a tree common in India and its islands, called the Poon-wood Tree, *Calophyllum inophyllum.* Another, from South America and the West Indies, is obtained from *Zanthoxylum* (*Fagura*) *octandra*—this is usually called Shell Tacamahac. A third, also from South America, is yielded by a tree called *Icica tacamahaca;* it is supposed to be the Mexican Copal. And the fourth is from North America, and is the produce of the Carolina or Tacamahac Poplar; it is collected in small quantities, and has only a small value for supposed medicinal properties. The others are chiefly used for varnishes.

TA'CCA, a genus of plants of a small natural order called *Taccaceæ*, nearly allied to *Araceæ.* They are large perennials with tuberous roots. The species are few, and are found in maritime places and woods in the South Sea Islands and the warmest parts of Asia and Africa. Some of them (*T. pinnatifida*, &c.) are much cultivated for the sake of their tubers, which are used as an article of food, although they are acrid, and require maceration in water to remove their acridity, on account of which also they are generally eaten with vinegar, or some acid substance. They contain a large quantity of starch, which is wholesome and nutritious, and is imported into Britain as a substitute for West Indian arrow-root. It is known as *Tahiti Arrow-root.* Dr Seemann says that it is an effectual cure for dysentery, which other arrow-root is not.—The boiled leaf-stalks of the plants of this genus are also used in China and Cochin-China as an article of food.

TA'CIT RELOCA'TION, in the Law of Scotland, is a phrase borrowed from the Roman law, signifying that when a tenant continues in possession of the lands after his lease or term has ended, there is an implied or tacit renewal of the lease, whereby he continues bound to pay the same rent and observe the same stipulations.—The same doctrine exists in English law, though the above phrase is not used.

TACITU'RNITY, in the Law of Scotland, is a mode of extinguishing an obligation by mere silence, and making no claim upon it within a long time. It is a distinct ground, and embraces a shorter period than the ordinary prescription or Limitation (q. v.); for if a creditor never apply for payment or performance of the obligation, a presumption arises either that there never was such an obligation, or that he has abandoned it. Much depends on the circumstances of each case whether such a doctrine is applicable; and, as a general rule, the periods of prescription are adopted as superseding the common law doctrine of taciturnity.

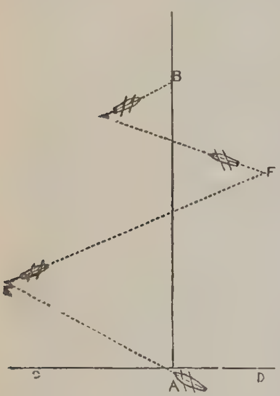
TA'CITUS, Caius Cornelius, the historian. Of his parentage, or of the time and place of his birth, we can only conjecture that his father was probably Cornelius Tacitus, a Roman eques, who is mentioned as a procurator in Gallia Belgica, and who died in 79. From the emperors Vespasian, Titus, and Domitian, he received promotion and other marks of favour; and in 78, he married the daughter of Caius Julius Agricola. In 88, when Domitian was emperor, and T. prætor, he assisted as one of the quindecemviri at the celebration of the *Ludi seculares.* Agricola died in Rome in 83, while T. and his wife were absent; and nothing further is known of the historian till 97, when, in the reign of Nerva, he was appointed consul suffectus, succeeding T. Virginius Rufus, whose funeral oration he delivered. T. had already attained distinction as an orator when the younger Pliny was entering upon public life; and both of them were appointed, in Nerva's reign, in 99, to conduct the prosecution of Marius, then proconsul of Africa. T. became one of the most intimate friends of Pliny, of whose letters 11 are addressed to him. The time of T.'s death is unknown, but he most probably survived Trajan, who died in 117. His extant works are: (1) *Vita Agricolæ*, written after the death of Domitian in 96, and universally admired as a masterpiece of noble sentiment and pregnant epigram. (2) *Historiæ*, written after Nerva's death in 98, and before the *Annales*, and embracing the period from the second consulship of Galba in 68 to the death of Domitian in 96. Only the first four books have reached us in a perfect state, but there must have been many more. (3) *Annales*, commencing with the death of Augustus in 14, and closing with the death of Nero in 68. These also have reached us only in an imperfect state. (4) *De Moribus et Populis Germaniæ.* This treatise is trustworthy only as regards those Germans who were best known to the Romans from their proximity to the Rhine. For the provinces beyond that river, it has no value, whether geographical or political. (5) *Dialogus de Oratoribus*, if the work of T. at all, must be his earliest. T. is one of the greatest of historians. In love of truth and integrity of purpose, he is equalled by few; in conciseness of phrase and power of saying much and implying more in one or two strokes

of expression, he is rivalled by none. The best editions are those of Orelli and Halm.

TACK, the Scottish law-term synonymous with Lease (q. v.).

TACK, TACKING. The *tack of a sail* is the lower windward corner. The *tack* is the rope employed in hauling down that corner to its proper position. The *tack* of a fore-and-aft sail is its lower forward clue or corner; it also designates the rope for hauling down that corner. A ship is said to be on the *starboard* or *port tack* when she is close-hauled with the wind on the starboard or port side.

Tacking is the practice of beating up against an adverse wind by a zigzag course. If a vessel at A require to sail due north to B, and if the wind be either north, or from any point north of the line CAD, it is obvious that the wind will not carry her directly to her destination. As an extreme case, let the wind be north, or dead against her. By setting her sails obliquely, as at A, it will be possible to beat up in the direction AE. If the master consider that at E he has passed sufficiently from his straight course to B, he will then put his helm a-lee, which brings the ship's head straight to the wind, the tacks of the sails being at the same time set free. The after-sails are then smartly braced over to the opposite side, and the ship's head falls off from the wind in an opposite direction to that previously held, until the course is EF. This process is repeated on each side of the line AB, until at length the ship makes her port, B. The length of each tack, as EF, is called a *board*. When the wind is straight ahead, as in the above example, the several boards should obviously be equally on each side of the line AB. If, however, the wind were not so direct, it would be necessary that the boards in one direction should be shorter than those in the other. Sometimes, from the nature of the channel, as an estuary, &c., it is necessary to take a long tack one way, say to starboard, and a very short one to port. This is known as 'sailing with a long and a short leg.'



TACKING OF MORTGAGES, in the Law of England, is a practice that sometimes occurs in the course of mortgage securities, when one person acquires more than one mortgage over the same estate. Thus, though mortgages, according to the general rule, rank according to the order of date, yet, if a third mortgagee, who became so without notice of a second incumbrance, purchase the first mortgage even after notice of the second mortgage, so as to acquire a legal title, and if he holds them both in his own right, he can tack the one to the other, and so obtain priority for the third mortgage over the second mortgage. This is on account of an old technicality, scarcely intelligible to other than lawyers.

TACO'NIC SYSTEM, an extensive series of rocks in the United States, described by Dr Emmons. They consist of two divisions, the Upper having a thickness of 25,000 feet, and containing Lower Silurian fossils; and the Lower, with 5000 feet of thickness, in which, as yet, no fossils have been found, but which is generally considered to be the equivalent of the Cambrian rocks of Britain.

TA'CTICS, MILITARY. Strategy (q. v.) is the art of manœuvring armies with reference to the objects of the whole campaign—the securing of communications, the cutting off an enemy from his base, throwing him into a position where he must fight at a disadvantage, or surrender, &c. Tactics has regard to the evolutions of an army in the actual presence of an enemy. It is the strategy of the battle-field; the science of manœuvring and combining those military units which drill, discipline, and the regimental system have brought to the perfection of machines. It was admirably described by Napoleon as *the art of being the stronger*—that is, of bringing an overwhelming force to bear on any given point, whatever may be the relative strength of the entire armies opposed.

The earliest records of battles are those of mere single combats, in which the chiefs, fighting either on foot or in chariots, performed great deeds; and the commonalty, who apparently were without discipline, were held in profound contempt. With the growth of democracy arose the organisation of the Phalanx (q. v.), the advance of which was irresistible; and its firmness equally so, if charged in front. It, however, changed front with great difficulty; was much deranged by broken ground; and failed entirely in a pursuit, or if attacked in flank. Far lighter, and more mobile, was the Roman Legion (q. v.). Among Roman tactics was also the admirable intrenchment, which they scarcely ever omitted as an additional source of strength for their position.

'Events reproduce themselves in cycles;' and with the decay of Roman civilisation came again the mail-clad heroes and cavaliers—mounted this time on horses—who monopolised the honours of battle, while the undisciplined footmen had an undue share of the dangers. Later in the feudal period, this disparity between knight and footmen was diminished by the employment of bodies of archers, whose shafts carried distant death. The adoption of gunpowder for small-arms altogether neutralised the superiority of the armoured knight. This change brought infantry into the front place in battle, and threw cavalry into the status of an auxiliary. The French revolutionary wars tended much to the development of artillery as a field-weapon, and Napoleon employed this terrible engine to its fullest extent, a practice followed by the best modern generals, who never risk a man where a cannon-ball can do the work. Frederick the Great was considered an innovator for fighting with infantry four deep. During the French War, the formation of three deep became general, and still obtains in several European armies. Before the battle of Waterloo, the British leaders had acquired sufficient confidence in their troops to marshal them in a double line. It is doubtful whether the advance in arms of precision will not soon necessitate the formation in a single line, or even in a single line in open order.

It is impossible, in an elementary article of this character, to give even an approach to an essay on modern tactics, which is an intricate science. We can only notice briefly a few of the more important principles.

First, as to the art of being the stronger, which is undoubtedly the highest recommendation in a general, we may cite the example of the battle of Rivoli. In 1796, Napoleon was besieging Mantua with a small force, while a very much smaller army

operated as an army of observation. The Austrian commander had collected at Trent a force powerful enough to crush completely the French army, with which he was marching south. Parallel with his course lay the Lake of Garda, and to prevent the enemy escaping up one side, as he marched down the other, the Austrian leader divided his army into two powerful corps, and marched one down each side of the lake. The instant the young French general knew of this division, he abandoned the siege of Mantua, collected every available man, and marched against one body of the enemy. Though far inferior on the whole, he was thus superior at the point of attack, and the victory of Rivoli decided virtually the whole campaign. This corresponded in principle with Napoleon's general plan in battle. He formed his attack into column, tried to break through the centre of the enemy's line; and if he succeeded, then doubled back to one side, so as to concentrate the whole of his own force against one half of the enemy's, which was usually routed before the other half of the line could come up to the rescue.

Taken collectively, the tactics of the three arms may be thus summarised: The infantry form the line of battle, and probably decide the day by a general advance over the enemy's ground. The cavalry seek to break the opposing infantry by frequent charges in front, or on any flank which may be left exposed. If a part of the line wavers, a charge of horse should complete the disarray. When the rout commences, the cavalry should turn it by furious onslaught into utter discomfiture. The province of the artillery is to cannonade any portion of the line where men are massed, or where a charge is about to be made; to demoralise cavalry, and generally to carry destruction wherever it can best disconcert the enemy.

Adverting now very briefly to the tactics of the several arms individually, we have—

Infantry.—This force has four formations—skirmishers, line, column, and square. The skirmishers precede and flank an advancing line or column, picking off the enemy, whose masses offer good mark, while their own extended order gives them comparative impunity. If resistance be encountered in force, the skirmishers retreat behind their massed supports. The line is a double or treble line of men, firing or charging. For musketry purposes, it is the most formidable formation, and is the favourite British tactic in every case where the officers can depend on the steadiness of their men. For bursting through a line, the deep column is the most effective. It is the favourite French formation, and during the Revolutionary and Napoleonic wars, the British and Russians alone succeeded in resisting it. At Vimiera, the 50th Regiment, 700 strong, stood in line: it was attacked by a column of 2000 French. The English colonel threw back his left (which was the end attacked), and advanced his right, delivered a volley at point-blank range, charged the column in flank, and utterly routed it before the French could deploy into line to resist the onslaught. The column is therefore the best formation on a march; the line, when in actual collision with the enemy. The formation in Echelon (q. v.) to a great extent combines these advantages. See SQUARE.

Cavalry.—The function of heavy cavalry is limited to the charge in line. The light cavalry form in small sections, to scour the country, collect supplies, and cut off stragglers.

Artillery.—No distinct tactics exist for this arm beyond the fact, that a concentrated fire is vastly the most effective, and that the artillery should always have a support of infantry at hand, to protect it from a sudden incursion of hostile cavalry.

Tactics of position depend on the moral energy of the commander-in-chief. Few would dare as Cæsar did, an invasion in which there was no retreat if defeated. It is a military maxim not to fight with the rear on a river, unless many bridges be provided for retreat, in case of disaster. A convex front is better than a concave front, because internal communication is more easy. The flank should be protected by cavalry, or preferably by natural obstacles. In battle, a long march from one position to another, which exposes the flank to the enemy, is a fatal error. By such, the French won Austerlitz, and lost Talavera. In a pursuit, a parallel line is better than the immediate route the retreating enemy has taken, as supplies will be more readily procured, and he may by celerity be attacked in flank. This was strikingly exemplified in the Russian pursuit of Napoleon's army retreating from Moscow.

TACTICS, NAVAL. With the advent of steam iron-plated ships, and rams, the tactics under which Rodney and Nelson fought and conquered have passed away, while the principles of the new warfare have scarcely been sufficiently established for reduction to theory. A glance at the obsolete tactics of bygone times must therefore suffice in the present article.

In ancient naval engagements, where the vessels fought on the comparatively smooth waters of the Mediterranean, and where the use of oars rendered the commanders nearly independent of the wind, the attack consisted of a charge with the beaked prows, followed, if that failed, by the use of balistæ and a hand-to-hand struggle. See NAVIES, ANCIENT. The introduction of gunpowder, with broadside ordnance, necessitated a change, and the great desideratum of each admiral was to present as long a line of broadsides as possible to the enemy, to take care that none of his ships was masked by the intervention of another between it and the foe, and to endeavour in each ship to oppose its broadside to the bow or stern of a hostile ship, so as to obtain the preponderance of force, and to rake his decks. The ships of two decks and upwards formed the line of battle, while frigates and smaller vessels served as look-outs and skirmishers. A fleet in one line would, however, have been of inconvenient length for sailing, and it was usual to sail in three, six, or nine parallel lines while traversing the ocean, the ships of the rear lines tacking into their places in the line of battle on the signal to form for action. The great principle of manœuvring was to get the weather-gage, i. e., to be to windward of the enemy, both for facility of navigation, and because the smoke would inconvenience him most. The standing attempt during the French war was to double the enemy's line (see CLERK, JOHN, of Eldin) by piercing it, or passing it at the van or rear, and then, by tacking in its rear, to place his ships between two fires. This was first practised in Lord Rodney's action of 1782, and was successfully repeated by Nelson at the battle of the Nile. Under steam, and with ships carrying colossal ordnance, naval tactics have entirely changed. It used to be the object to avoid being raked; it is now to avoid being hit at all. The projectiles used are so tremendous that a few hits involve destruction. Ships are consequently constructed so as to offer the least mark to ordnance; and with the same view, they are kept constantly in rapid motion. Actions are fought, not, as in old time, within pistol-shot, but at a mile or two miles' distance. The loss of life is less; for the battle is no longer decided hand to hand by the cutlass and the boarding-pike, following a furious cannonade;

but after a few long shots with ponderous missiles, one or other vessel becomes disabled, and being helpless, yields the victory to her foe. The ships will be steamed end on if they act as rams, and also to offer less mark to shot. Rival fleets have never yet met on a large scale to fight under the conditions of modern war.

TA'DMOR. See PALMYRA.

TA'DPOLE. See FROG.

TAEL, a money of account in China, is equivalent to about 5s. sterling, or to a thousand of their sole coin, the 'tsëen,' or 'cash.' It is also a weight, and is equivalent to about 1⅓ oz. avoirdupois.

TÆ'NIA, the band over the epistylium or architrave in Doric architecture.

TÆNIA AND TÆNIADÆ. See TAPEWORM.

TÆNIIDÆ, or TÆNIOI'DÆ. See RIBBON-FISH.

TAE-PINGS, the name given to the Chinese rebels who made their appearance in 1850, and (see CHINESE EMPIRE) desolated some of the best cultivated provinces of China. Pekin was taken by the English and French on 12th October 1860. Its capture was followed by the ratification of the treaty of Tien-tsin, which, granting important privileges to European merchants, made it the direct interest of the English, French, and American governments to re-establish order in China. The repulse of the rebels at Shanghai in August 1860 had been followed by several engagements between them and the imperialists, in which they were defeated. Ward, an American, who had taken service under the emperor, and who shewed a remarkable talent for organising irregular troops, had wrought a wonderful improvement in the imperialist army, and he was the chief means of their success. In the beginning of 1862, the T. again advanced on Shanghai, and were twice defeated. In the autumn of the same year, Ward was killed. Some time previously, English officers were permitted, by an order in Council, to take service under the emperor of China; and 'Ward's force,' handed over to an English officer, took the name of Gordon's brigade. Permission was also granted to Captain Sherard Osborne to organise in England a small fleet of gun-boats, to ascend the Chinese rivers and re-establish order. Gordon's brigade rendered essential service to the imperial government. The rebels were defeated in upwards of 16 engagements; and in 1864, almost every important city was taken from them. Captain Sherard Osborne's expedition was less successful. He found that the jealousy of the Chinese officials would not permit him to take the steps necessary to discharge properly the duty he had undertaken, and he therefore threw up his commission, and returned to England. The conduct of the imperial authorities at Su-chow, where a horrible massacre took place, led to the withdrawal of the English military force; but the rebellion had been effectually checked. Towards the end of 1864, the T., however, still offered an opposition to the Imperialists in Kiang-tsu, all the more formidable in consequence of the prevalence of brigandage and insurrectionary movements in parts of the empire not affected by the Tae-ping rebellion. In January 1865, the Mohammedan Tartars of Songaria, on the Siberian frontier, assisted by the free Kirghis tribes, took the town of Tarbagatai and afterwards Kouldja. In the following June a still more serious insurrection broke out in China proper, that of the Nien-fei or rebels of the north, whose special object was to overturn the reigning dynasty. One body of them, in the beginning of 1866, caused serious alarm at Hankow, and would have attacked the European settlement but for the arrival of some English gun-boats. It is believed that the last embers of the Tae-ping rebellion were trodden out in February 1866, when from 30,000 to 50,000 rebels were routed by the imperial army at Kia-ying-chou in Kwei-tung. The victorious general then set out to attack the Nien-fei, or northern rebels, at Hankow, and the imperial troops were several times defeated by them in 1867; but late in 1868 their operations became unimportant.

TA'FFETY (or Taffeta), a term of somewhat general application in silk-mercery. It was formerly applied to all plain silks simply woven by regular alternations of the warp and weft, and is by some writers supposed to be the first kind of silk-weaving known even to the Chinese, from whom it came to us. Modifications have, however, been introduced, by varying the quality of the warp and weft, and by the substitution of various colours for the single one of the original taffety. It has therefore become a sort of generic term for *Plain Silk*, Gros de Naples, Gros des Indes, Shot or Chameleon silk, Glacé, and many others, and even for some combinations of silk wool, and other materials.

TAFFRAIL, in a Ship, is the rail over the heads of the stern-timbers, extending across the stern from one quarter-stanchion to another.

TA'FIA, a name used in the sugar-producing colonies for a kind of rum distilled from molasses. The term is only in general use in French colonies.

TAFILELE'T (or Tafilelt), one of the four territorial divisions of Morocco (q. v.).

TAGANRO'G, an important seaport of South Russia, stands on the north shore of the Sea of Azov, 20 miles north-west of the chief mouth of the Don. It was founded by Peter the Great in 1696, was lost to Russia from 1712 till 1774, when it again reverted to the people who founded it, and since that time it has increased in importance yearly. The port of T. is so shallow that large ships cannot approach within half a mile of the quay, and at this distance from shore they load and unload by the help of barges. The harbour is wholly unprotected. Owing to its position on the shore of a very fertile country, it is able to export wheat in large quantities (933,295 quarters being exported in 1864), as well as linseed, hempseed, skins, wool, butter, iron, copper, and Russian leather. Of these articles, the last four are obtained from the governments of Perm and Orenburg, and are exported chiefly to Turkey, Greece, and Italy. In 1868, 1359 vessels, of upwards of 415,830 tons, entered and cleared the port; and the exports for that year, according to the British consul's report, amounted to £5,877,200; the imports, chiefly wine, agricultural implements, and machinery, tea, fruits, and porter, amounted to £590,464. Pop. 42,304.

TAGLIONI, MARIE, a celebrated *danseuse*, born at Stockholm 23d April 1809, of Italian parents, her father (Filippo T., born at Milan, 1777) having been successively ballet-master at several opera-houses in different parts of the continent. Mademoiselle T. made her début in Paris in 1827, where she created a perfect *furor*, and her position was at once recognised as the first of ballet-dancers. In 1832 she married Count Gilbert de Voisins, and in 1847 retired from the stage, having amassed a large fortune, and afterwards resided in Italy. Died in 1884.

TA'GUS (Span. *Tajo*), the largest river of the Spanish Peninsula, rises on the frontier of New Castile and Aragon, between the Sierra de Albarracin and the Sierra de Molina, about 45 miles north-east of the city of Cuenca. It first flows north-west for about 30 miles to its union with the Gallo, at which point it curves to the south-west, and flows

in that direction to Toledo, whence it flows west to Abrantes in Portugal. From Abrantes the river flows south-west, and passing Lisbon, enters the Atlantic about 10 miles lower down. At Peralejos, a few miles from its source, it is 1 foot deep, 15 paces broad, and confined between rocky walls 400 feet high. At the city of Toledo, it breaks through a romantic rocky pass, the walls of which are upwards of 200 feet high. From Villavelha, 18 miles within the Portuguese border, the T. is navigable to its mouth, a distance of 115 miles. Above Lisbon, the river widens like an estuary, being in some places 5 miles broad; opposite Lisbon, however, it is only one mile broad. The principal affluents are the Jarama, Guadarrama, Alberche, Alagon, and Zezere from the north, and the Guadiela and Rio del Monte from the south. Total length, 540 miles.

TAHI'TI, or OTAHEITE, the chief of the Society Islands (q. v.), is 32 miles long, about 120 miles in circumference, and consists of two peninsulas, connected by an isthmus about 3 miles broad, but which is submerged at high water. Pop. (1862) 13,800, of whom more than 13,000 are natives. The chief town is Papiete, with a safe harbour, a patent slip for vessels of 400 tons, and careening quays. For the trade, history, &c. of T. see SOCIETY ISLANDS.

TAIL, ESTATE, is, in English Law, an estate given to A and the heirs of his body, or A and the heirs-male of his body, or some other class of heirs less extensive than the class of heirs-at-law. It was anciently a question whether in such a case A, the father, could defeat the right of the children, and break the entail. In England, it was early decided that A could, by a sham process, called a fine or Recovery (q. v.), break the Entail (q. v.); while in Scotland a mode of preventing A, or any of his successors, from breaking it, has been legalised since 1685. In all the states of the United States, entail-estates have been declared or have become estates in fee-simple.

TAILOR-BIRD (*Orthotomus*), a genus of birds of the family *Sylviadæ* (q. v.), with a long graduated tail, the feathers of which are narrow. The species are numerous, natives of the East Indies and of the Indian Archipelago, and haunt cultivated grounds,

Tailor Bird and Nest (*Orthotomus longicaudus*).

where they are commonly seen in pairs. Their flight is rapid and undulating, and they seldom ascend above the lower branches of trees. The name *Tailor-bird* is derived from the way in which the nest is formed. Two leaves are taken at the extremity of a twig, and are sewed together by their edges, or a large leaf is sewed together; the necessary holes being made by the bill, and vegetable fibres forming the thread. Within the hollow thus made, a quantity of a cottony substance is placed to receive the eggs.

TAI'LZIE, the ancient term in the law of Scotland to denote a deed creating an entailed estate. See ENTAIL.

TAIN, a royal, parliamentary, and municipal burgh in the county of Ross and Cromarty, on the south shore of the Dornoch Firth, and 24 miles north-north-east of Inverness. There is no proper harbour. The most interesting building is a small ruined chapel, remarkably rude and simple in architecture, and said to date from the 13th c.; and there is also a collegiate church, founded in 1471, and an endowed academy incorporated by royal charter. Brewing and iron-founding are carried on. Pop. of parliamentary burgh about 2500.

TAINE, HIPPOLYTE ADOLPHE, a French critic, was born at Vouziers in Ardennes, 21st April 1828, and studied at Paris, where in 1853 he obtained the diploma of *docteur ès lettres*, for two essays, *De Personis Platonicis*, and *Essai sur les Fables de Lafontaine*. They were followed by his *Essai sur Tite Live* (1854), crowned by the French Academy; *Voyage aux Eaux des Pyrénées* (1855), *Les Philosophes Français du dix-neuvième Siècle* (Paris, 1856), *Essais de Critique et d'Histoire* (Paris, 1857), *Histoire de la Littérature Anglaise* (Paris, 1864), *Philosophie de l'Art* (Paris, 1865; Eng. transl., Lond. 1866); and *Voyage en Italie* (1866). Of these works, by far the most important in itself, and the most interesting to Englishmen, is the *Littérature Anglaise*, in which the author surveys and criticises our whole literature from a point of view which is conceived to be rigorously scientific. According to T., there are three things to be borne in mind when writing the history of a nation's literature: first, the *race* to which the nation belongs; second, its *position* both geographical and in civilisation in the different phases of its literary development; and third, the *period* or duration of these. Under this view, the history of literature assumes the character of a psychological problem, and as such, it is discussed by T., whose speculative ingenuity is as wonderful as the brilliancy and acuteness of his criticism. Every page affords matter for reflection, overflows with the finest eloquence, or sparkles with the keenest wit. Whether or not we agree with the theories and critical *dicta* of the writer, we cannot fail to be struck with their novelty, force, and coherency.

TAI-WAN-FOO, the capital of the island of Formosa (q. v.), on a large alluvial plain on the south-west coast, in lat. about 23° N. It is a large straggling town, contains many park-like spaces with fine trees and green lanes, and is surrounded by a high battlemented wall, six miles in extent. Its chief edifices are the residences of the mandarins and the temples. The commerce of the town was once considerable, but owing to the silting up of the harbour, trade has entirely departed, and no European vessel of the smallest burden can enter the so-called port. Sugar is raised and refined in large quantities in the neighbourhood. The number of inhabitants is not stated, but it is probably large, and certainly decreasing.

TAI-YUAN, China. See SUPPLEMENT in Vol. X.

TALAVE'RA DE LA REY'NA, a town of Spain, in New Castile, in the modern province of Toledo, is charmingly situated on the Tagus, 75 miles south-west of Madrid. It is ancient, straggling, dirty and inconvenient, is surrounded by interesting old

walls, and abounds in antique picturesque fragments. It was formerly a flourishing town; but of its manufactures, only that of silk is now carried on. Fruits are extensively produced in the vicinity. Here, on the 27th and 28th July 1809, Sir Arthur Wellesley, with 19,000 English and German troops, and about 34,000 Spaniards, who, however, with very trifling exceptions, were not engaged, defeated upwards of 50,000 veteran French troops, under Joseph Bonaparte and Marshals Jourdan and Victor. Pop. 7000.

TALBOT, perhaps originally a name equivalent to Blood-hound (q. v.), but afterwards applied to a race of hounds, now extinct, or nearly so, which seem to have been kept for show rather than for use. The T. was of a pure white colour, with large head, very broad muzzle, long pendulous ears, and rough hair on the belly. The White St Hubert Dog was either the T. or a nearly allied breed. The T. is the badge of the ancient House of Shrewsbury (surname Talbot), and the crest of some of the princely Houses of Germany.

TALBOT, WILLIAM HENRY FOX, celebrated in connection with photography, was the son of William D. Talbot of Locock Abbey, Wilts, and was born in 1800. He was educated at Harrow, and afterwards at Trinity College, Cambridge, where he took his degree with honours, and obtained the junior Chancellor's Medal in 1821. In the first parliament summoned after the passing of the Reform Bill, T. sat for Chippenham; but scientific investigation being more to his taste, he gave up politics, and devoted himself to the problem of fixing shadows, ignorant at the time of what had been effected in this department by Wedgwood and Davy. Step by step he discovered for himself a method of obtaining and fixing sun-pictures, and on the dissemination of a report as to Daguerre's successes in the same field, secured his just rights by publishing a paper (*Phil. Mag.* March 1839), in which the successive steps of his investigation and their result were detailed. See PHOTOGRAPHY. This process, by which a *Negative* (q. v.) was primarily obtained, was subsequently improved by his invention (patent dated February 8, 1841) of the Calotype (q. v.) process. Soon afterwards he obtained fresh patents, for an 'instantaneous process' (which seems to have well deserved the name, as by it a legible picture was obtained of a printed bill fastened to the rim of a wheel revolving 200 times per second), a mode of 'photographic engraving,' and a 'polyglyptic process.' His last invention in photographic art was *Photoglyphic Engraving* (q. v.), which was patented April 21, 1858. In 1842, T. obtained the medal of the Royal Society for his previous discoveries. In later years, he devoted himself to the study of general physics; he also occupied himself with the cuneiform inscriptions of the East; and wrote several works, as *Hermes, or Classical and Antiquarian Researches; Legendary Tales; Illustrations of the Antiquity of the Book of Genesis;* and a work on *English Etymologics.* He died September 17, 1877.

TA'LBOTYPE, a photographic process, called by the inventor, Mr Fox Talbot, the Calotype Process (q. v.). Its essential features consist in the production in the camera of an image by light *on* the *surface* of chemically prepared paper, and this distinguishes it from other *paper* processes, and by consequence from other photographic processes.

TALC, a mineral allied to Mica (q. v.), and, like it, easily separated into very thin flakes, which are transparent and flexible, but not elastic, like those of mica. T. is composed almost entirely of silica and magnesia, in the proportions of 57—63 silica, and 30—35 magnesia, with 2—6 water. Its colours are silvery white, greenish white, and green. It has a pearly or semi-metallic lustre, and is unctuous to the touch, in which it differs from mica. It occurs crystallised, generally in hexagonal tables, or in long prisms: the primary form is a rhomboid. It is also found massive, in beds chiefly in micaceous schists, gneiss, and serpentine.—A kind called *Indurated T.*, or *T. Slate*, has a curved slaty structure, and is not separable into laminæ, like common talc. It approaches in character to steatite, and is used for similar purposes.

TALEGA'LLA, a genus of Gallinaceous birds, of the family *Megapodidæ*, having a strong, thick, and very short bill, the upper mandible curved and pointed; the head and neck almost quite naked; the wings short and round; the tail rather long, rounded on the sides; the legs strong, feathered a little below the joint of the tibia and tarsus; the tarsi covered with scales in front; the toes long and strong; the claws large and sharp. The species

Brush Turkey (*Talegalla Lathami*).

are natives of Australia and New Guinea. The best known is the BRUSH TURKEY (*T. Lathami*) of Australia, also known as the WATTLED T. and the NEW HOLLAND VULTURE, the latter name being given to it on account of its naked head and neck, covered in part with fleshy wattles. It is pretty common in New South Wales, inhabiting the most thickly wooded parts. It is a large bird, about the size of a turkey, with blackish-brown plumage. It is shy, and when pursued, endeavours to escape by running through the thickest *brush*, or by leaping to the lowest branches of a tree, from which it ascends higher and higher, branch by branch. It thus avoids the dingoes or native dogs, which, however, often hunt it down on open ground. It is easy game to the sportsman, who finds it roosting under shelter of the branches of trees during the heat of the day, and although several of a flock are shot, the rest keep their place undisturbed. The T. is generally seen in small flocks, and they make their nests together, the males heaping up, by means of their feet, mounds of several cart-loads of earth and decayed leaves, which are used from year to year, new materials being added every year. The eggs are hatched by the heat of the sun and of the fermenting mound, each egg being separately buried. The parent birds partially uncover them during the day. Nearly a bushel of eggs may sometimes be found in a single heap. The male bird pays great attention to the young after they are hatched, covering them up partially in the mound at night for warmth. The flesh of the T. is excellent, and the eggs are also very delicate and eagerly sought after. It is thought that this bird might easily be added to the list of our domestic poultry.

TALENT (Gr. *talanton*, from a root to balance or

weigh), a word used by Homer to signify indifferently a balance, and a definite weight of some monetary currency. But the weight of money to which Homer applies the term talent was very different from that to which it was applied in later times. Tradition assigns to Pheidon, king of Argos, the introduction of the talent as a standard of money and weight. The *exact* identity of the Æginetan talent with that known as the Babylonian, and generally employed in the East, points to its true origin. It was in all probability introduced into Greece by the Phœnicians, who also introduced a smaller monetary measure and weight, which was by the Greeks known as the Euboic talent. The names Æginetan and Euboic indicate that the talents to which these epithets apply were first used in Ægina and Eubœa; and though, in the East, the larger talent was used for silver, and the smaller for gold, after their introduction into Greece all such distinctive application was soon done away with. The use of the Euboic talent was mostly confined to Athens, Chalcis, and the Chalcidian colonies; while the Æginetan prevailed over the rest of the Greek world. In the 6th c. B. C., Solon introduced at Athens a new talent, which, as the *Attic talent*, succeeded, partly through its superior purity, and partly on account of the greater commercial activity of Athens, in supplanting the other two standards. These several talents were similarly subdivided into 60 minæ, the mina into 100 drachmæ, and the drachma into 6 oboli; and their relative proportions are, Æginetan T. : Euboic T. : : Attic T. : : 30 : 25 : 18, both with respect to their values as weights, and as measures of monetary amount. The following are the values as compared with English standards:

		AS WEIGHT.		AS MONEY (SILVER).
		lbs. avoirdupois.		£ s. d.
Æginetan talent	=	95·	=	406 5 0
Euboic "	=	79·16	=	338 10 10
Attic "	=	57·	=	243 15 0

But by the same decree of Solon, a new commercial talent, of increased weight, was introduced, but only as a weight for goods, not for money.


Talipat Palm (*Corypha umbraculifera*).

TA'LIPAT PALM, or Great Fan Palm (*Corypha umbraculifera*), the noblest palm of the East Indies, a native of Ceylon, Malabar, &c. It grows to the height of 60, 70, or even 100 feet, and has a straight cylindrical trunk, crowned with a tuft of enormous palmate plaited leaves, which are divided near the outer margin into numerous segments, and are united to the trunk by spiny leaf-stalks. The leaves are usually about 18 feet long, exclusive of the leaf-stalk, and 14 feet broad; a single one being sufficient to protect 15 or 20 men from rain. At the age of 30 or 40 years, the tree flowers, and after ripening fruit, generally dies. It produces a long conical erect spadix, rising to the height of 30 feet from the midst of its crown of leaves, and dividing into simple alternate branches, the lower of which sometimes extend laterally 20 feet, the whole covered with whitish flowers, and forming a very beautiful and magnificent object. The fruit is very abundant, globose, and about an inch and a half in diameter. The leaves are used for covering houses, for making tents, and for many other purposes. On occasions of ceremony, every Singhalese noble is followed by an attendant, who carries above his head a richly ornamented T. P. leaf, which is capable of being folded up like a fan, and is then not thicker than a man's arm, and wonderfully light. The leaves of this palm are used in Malabar for writing upon, characters being traced upon them with an iron style. They are prepared for this purpose by boiling, drying, damping, rubbing, and pressing. The soft central part of the stem, pounded and made into bread, has often been of great use in times of scarcity.

TA'LIPÉS, the scientific name for CLUB-FOOT (q. v.). It is derived from the Latin words *talus*, the heel, and *pes*, the foot.

TA'LISMAN (Arabic, but supposed to be derived from the Gr. *telesma*, in the sense of celebration of religious ceremonies), a species of charm, consisting of a figure engraved on metal or stone when two planets are in conjunction, or when a star is at its culminating point, and supposed to exert some protective influence over the wearer of it. The terms Talisman and Amulet (q. v.) are often considered nearly synonymous, but the proper distinctive peculiarity of the former is its astrological character. Talismanic virtues have often been attributed to a peculiarly marked or formed egg, and instances are recorded, by various authors, of eggs hatched with figures of comets or eclipses on them. A species of talisman, which has acquired considerable celebrity, is the Abraxas Stone (q. v.). A species of talisman, at present in use in Asia, is a piece of paper on which the names of the Seven Sleepers and their dog are inscribed. Pasted on the walls of houses, it is believed to be a protection against ghosts and demons.

TA'LLAGE (said by Lord Coke to be from Fr *tailler*, to share or cut out a part), a name which has been sometimes applied generally to subsidies or taxes of every kind, but which, in its more proper and restricted sense, denotes those taxes to which, under the Anglo-Norman kings, the demesne lands of the crown and all royal towns were subject, which were far more rigorous and irregular than the taxes imposed on the gentry.

TALLAHA'SSEE, the capital of Florida, U. S., situated on a high plain, 180 miles east of Pensacola, a well-planned, and so far well-built embryo city. It is celebrated for its salubrious semi-tropical climate, and abundant springs of soft pure water. It is connected by railway with St Marks, 23 miles distant on the coast, and Pensacola. Pop. (1871) 2023; (1880) 2494.

TALLEYRAND-PERIGORD, CHARLES MAURICE DE, Prince of Benevento, the most subtile, shrewd, and unprincipled of all modern diplomatists, was born at Paris, February 13, 1754, of an ancient and distinguished family. His father, CHARLES DANIEL, COMTE DE TALLEYRAND-PERIGORD (b. 1734, d. 1788), was an officer in the French army, and fought all through the Seven Years' War. CHARLES MAURICE being the eldest son, would in all probability have been designed for a military career, had not an accident, which he met with when only a year old, rendered him lame for the rest of his life. He was, in consequence, trained for the church, and studied at St Sulpice, the Sorbonne, and Rheims, but at no period did he

betray the least inclination towards a Christian, or even a moral life. At the age of 20, he came to Paris, and rapidly acquired a reputation for licentiousness. This, however, did not prevent him from obtaining several ecclesiastical benefices, among others, the Abbacy of St Denis, in the diocese of Rheims (1775). Appointed *agent-général* for the clergy in 1780, a lucrative and important post, which brought him into close connection with the heads of the administrative in France, he now began a serious apprenticeship to public business, without, however, pausing in his career of gallantry. So notorious was his *infâme conduite* (as Mirabeau calls it), that, for some years, Louis XVI. shrank from conferring on him further ecclesiastical preferment, and it was only on account of his administrative abilities, that, in 1788, he obtained the bishopric of Autun. When the convocation of the *Etats-généraux* took place, in the year following, he was elected by the clergy of his diocese to represent it, and pronounced in favour of an amalgamation with the *Tiers Etat*, which, on the 17th June, had constituted itself the *Assemblée Nationale*. His attitude and speeches recommended him to the notice of the popular party, and along with Mounier, Sieyès, and Lally-Tolendal, he was appointed to draw up a constitution for the nation. In this capacity, he took an active part in framing the famous Declaration of Rights, and he was one of those selected (after the destruction of the Bastille) to investigate the causes and peculiar features of the revolutionary movement. It was T. who proposed (October 10, 1789) the startling measure for the confiscation of church property, arguing that such property did not really belong to the church, but to the nation, and that if the rights of the existing clergy were secured, the nation, or its representatives, were at liberty to apply it to any purpose they saw fit. On February 13, 1790, a decree for the suppression of religious orders was carried, in spite of a vehement opposition, and three days after, T. became President of the Assembly. He was one of the first among his order to take the oath to obey the constitution (December 28, 1790), and eagerly urged the clergy of his diocese to follow his example. About the same time, he demitted his bishopric of Autun, yet, in the following February, we read of his consecrating two new bishops (those of Aisne and Finisterre), and although denounced in pontifical briefs as a schismatic, declaring his sincere attachment to the Holy See!

Our space does not permit us to describe the important share that T. had in the financial deliberations of this first period of the Revolution, but we must specially note the sagacity he displayed in pointing out the perils attending the issue of assignats, his skill in preparing the way for the adoption of the principle of uniformity in weights and measures, and of an arc of a meridian as the basis of the new metrical system; and above all, the luminous intelligence shewn in the Report which he gave in to the Assembly (September 10 and 11, 1791) upon Public Instruction—a Report conceived in the liberal and comprehensive spirit of the times, and which was undoubtedly the model followed in all the great changes that subsequently took place, when France reorganised her educational system.

In 17*92*, when the old European despotisms were obviously preparing to coerce the young republic, T. was sent to London—but not in an official character —to negotiate with the English government. He did not make a favourable impression on George III. or on Pitt. Thrice, in that year, he essayed to procure a recognition of the republican government, but in vain. The 'September massacres' (see SEPTEMBRISTS) made even the stanchest admirers of the Revolution shudder. Nothing, therefore, could be done; and T. would doubtless have returned to France, had not a letter of M. de Laporte, *intendant* of the civil list of Louis XVI., been discovered, in which T. was noted as a man 'disposed to serve' the king. He was immediately placed on the list of *émigrés*, i. e., proscribed (December 1792); and thus his connection with the Revolution—fortunately, we believe, for his reputation—was suddenly brought to a close. His career as an exile was (as is generally the case) one of hardship and insignificance. He remained in England till forced to leave by the 'Alien Bill,' when he sailed for the United States (February 1794), where he lived for more than a year. After the fall of the Terrorists, he procured the revocation of his banishment; and in March 1796, re-entered Paris, having paved the way for a favourable reception by a series of the most adroit and judicious intrigues. We may first note, *en passant*, that in private life he continued to play the *rôle* of a gay Lothario.

T. attached himself to the *cercle constitutionnel* that gathered round Madame de Staël, and so dexterously did he comport himself, that, in 1797, he was named Minister of Foreign Affairs in place of C. Delacroix. The rise of Bonaparte was a phenomenon which so penetrating a politician as T. could not overlook. He cultivated the friendship of the young general with a sagacious assiduity, keeping him constantly *au courant*, when away from Paris, of the situation of parties, and became his confidant in those designs, the execution of which resulted in the overthrow of the Directory, Brumaire 18 (q. v.), 1799. After this *coup d'état*, the subtle finesse of T. was constantly in requisition. He divined, with a sort of miraculous cleverness, the ideas of Bonaparte, and his whole policy was directed to consolidate the power and authority of his master. In all the diplomatic negotiations that followed the victories of France under the Consulate, he had the principal part; but Bonaparte thoroughly understood his man, and T. was quite conscious, as M. Thiers remarks, that he could never impose on his superior. It was he who proposed the kidnapping of the Duke d'Enghien (q. v.); and it was by his instructions that the crime was consummated, in spite of the vehement opposition of Josephine, whose honest indignation led her to denounce him, as a *maudit boiteux* (cursed cripple). T. took an active part in preparing the way for the establishment of the Empire (1804); and when, in the following year, England, dreading a French invasion, formed a powerful European coalition against France, it was by the ingenuity of T. that it was partially broken up. To him, as much as to Napoleon, was owing the organisation (1806) of the famous *Confederation of the Rhine* (q. v.), which so effectually served the ambitious designs of the emperor. In conducting the negotiations that brought about this Confederation, he exhibited a truly Macchiavellian art. Napoleon was not ungrateful. T. received the principality of Benevento, which he held as an imperial fief.

When the views of the emperor in regard to Spain became apparent, T., who, for more than a year had rather fallen into disfavour with Napoleon, came forward with a plan of his own, which, however, was not adopted; but his presence at the interview between Alexander and Napoleon at Erfurt (1808), proved that his influence was as yet undiminished. The ill success of the Spanish war (at first) induced T. to pronounce against it, and occasioned violent invectives on the side of his sovereign, to which the accomplished cynic (who

retained to the last the manners of the old noblesse) only replied by the sarcasm: '*Quel dommage qu'un si grand homme soit si mal élevé!*' (What a misfortune that so great a man should have been so badly educated!). T. declared in favour of the Austrian marriage; but already the *entente cordiale* between him and Napoleon was ruptured, and he began to look forward to a future in which his own schemes might be hostile to those of the emperor. In a word, he was meditating treachery against the power by which he had risen. The victories of Wellington in Spain, and the reverses of Napoleon in Russia and Germany, widened the breach between them, and T. now only waited the decisive moment in which to ruin the cause of his master. He became the centre of a group of Parisian malcontents, whose influence grew with the advance of the allied armies, and finally, communications were opened up with the latter and with the Bourbons. It was T. who dictated to the senate the terms of the deposition of Napoleon; and on the restoration of the Bourbons, he became Minister of Foreign Affairs in the first government of Louis XVIII. He was also head of the French legation in the celebrated Congress of Vienna; but after the battle of Waterloo, a coldness sprung up between him and the Bourbons, and he was relieved of all his offices. Henceforth, his career is uninteresting to the student of history. He caballed to regain power, but in vain; and during the reigns of Louis XVIII. and Charles X., he was merely a discontented senator, who never lost an opportunity of injuring the court and the government. After the July Revolution, Louis Philippe employed him as ambassador at the English court, where he contrived to bring about a friendly feeling between the new monarchy and the English government. During the brief remainder of his life, nothing externally notable occurred. He died at Paris, 17th May 1838. T. was neither a wise, nor a great, nor a good man; but he was infinitely cunning, dexterous, and supple. He had a larger share than most men of what Carlyle calls 'vulpine understanding;' and if this world had had nothing but knaves and fools in it, the policy and principles of T. might have enjoyed a perpetual triumph; but there were forces in the world, both intellectual and moral, of which he took no account, but which took account of him, and with all his amazing cleverness, dropped him into obscurity and disgrace. T. was an 18th c. sceptic, over whom the Revolution had exercised little influence, while France, and indeed all Europe, had been roused into earnestness by the outburst; and when the ideas of political liberty began their swift, irresistible march, this *diable boiteux* inevitably lagged behind, and sunk out of sight. T. left *Mémoires*, which, however, were not to be published till 1868. For estimates of his character and policy, see the *Mémoires Politiques* of Lamartine; the *Histoire de Dix Ans* of Louis Blanc, where T. is rigorously criticised; the *Mémoires* of Guizot, where he is handled with equal severity and justice; *Notices et Portraits*, by Mignet; and *Vie Religieuse et Politique de Talleyrand* (Par. 1838), by L. Bastide.

TALLICOO'NAH OIL. See CARAPA.

TALLIEN, JEAN LAMBERT, a French Revolutionist, was born at Paris in 1769, and first became notable in the beginning of 1792 as the editor of a Jacobin journal, called *L'Ami des Citoyens*, meant to be a friendly rival of Marat's *Ami du Peuple*. From this date, his influence over the lower orders of the city steadily increased. He was conspicuous in the events of the 10th August, and in consequence received the appointment of secretary to the *Commune Insurrectionelle*. He promoted, and afterwards defended the massacres of September; and on account of his unscrupulous zeal, was elected to the Convention by the department of Seine-et-Oise. There he became the apologist, if not the advocate of Marat, denounced the minister Roland, urged with savage emphasis the condemnation of Louis XVI., and was rabidly eager for the ostracism and annihilation of the Girondists (q. v.). Towards the close of 1793, he was sent to Bordeaux, charged with the mission of destroying every trace of the party he hated. His career in the south-west was a mixture of reckless cruelty and shameful vice. To the odious tyrannies of a proconsul, he added the luxurious profligacy of a satrap. Fortunately for his countrymen, a passion which he conceived for one of his victims, Madame de Fontenay (*née* Cabarrus), led him to pause in his bloody course. He was called to Paris to account for this singular change in his disposition, satisfied his associates (by paroxysms of patriotic vehemence) that it meant nothing particular, and on the 22d March 1794, was chosen president of the Convention. Robespierre, however, had found out the sort of man that T. was. He hated him for his insincerity and immorality, felt instinctively that he could not be trusted, denounced him severely in the Convention, and on the 14th of June got his name erased from the list of members at the Jacobins. T. recognised his danger, and taking advantage of the reaction against the Terrorists (though himself one of the basest of the set), already beginning to shew itself in France, he dexterously rallied the Dantonists, Hebertists, and others against the rigorous government of Robespierre, St Just, and Couthon, and brought about the events of the 9th Thermidor (27th July 1794), which caused the fall of the triumvirate. T. now became for a short time one of the most notable and influential men in France; lent his aid to suppress the Revolutionary Tribunal and the Jacobin Club, and drew up the accusations against Carrier, Le Bon, and others of the Terrorists! But France could not long tolerate this affectation of virtue on the part of one so infamous; his past life was perpetually held up to scorn and reproach; and finally, on the 20th of May 1798, he was forced to leave the Council of Five Hundred. Henceforth, his career is pitiably insignificant. He accompanied Bonaparte to Egypt as *savant* (!), quarrelled with General Menou; and on his return to France, was captured by an English cruiser, and brought to England, where the Whig Opposition was stupid enough to make a hero of him (1801). Soon after, he returned to France, and was contemptuously dismissed as consul to Alicante by Talleyrand, outlived (in utter obscurity) the Empire of Napoleon, and died at Paris, 16th November 1820, supported in his last days by the heirs of the monarch for whose death he had inhumanly clamoured.

TALLOW. See OILS AND FATS.

TALLOW, MINERAL. See MINERAL TALLOW.

TALLOW TREE, the name given in different parts of the world to trees of different kinds which produce a thick oil or vegetable tallow, or a somewhat resinous substance, which, like tallow, is capable of being used for making candles. The T. T. of Malabar (*Vateria Indica*) is a very large tree of the natural order *Dipterocarpaceæ*. It has leathery leaves of 4—10 feet long, and panicles of white, fragrant flowers, with five petals. The stem is often 16 feet in circumference. By incisions in the stem, East Indian copal is got; and by boiling its seeds, there is obtained a firm, white, vegetable tallow, which, as it has no unpleasant smell, is particularly

suitable for making both candles and soap.—The T. T. of China (*Stillingia sebifera*) belongs to the natural order *Euphorbiaceæ*. The capsules are internally divided into three cells, each containing a nearly hemispherical seed, which is covered with a beautifully white vegetable tallow. This the Chinese collect for the manufacture of candles, in order to which, the capsules and seeds are crushed and boiled, and the fat skimmed off whilst in a melted state. To give it a firmer consistency, wax is added to it, in the proportion of three parts to ten of the vegetable tallow. Linseed oil is also added. The candles made of it are beautifully white. This tree has been introduced into North America, is cultivated about Charleston and Savannah, and is almost naturalised in the maritime parts of Carolina. It presents a very beautiful and remarkable appearance at the approach of winter, when the leaves become bright red, and the pericarps falling off, leave the white seeds suspended by threads.—The name T. T. is sometimes given in North America to a species of CANDLEBERRY (q. v.).—The T. T., or BUTTER AND TALLOW TREE of Sierra Leone, is *Pentadesma butyracea*, of the natural order *Guttiferæ*, the fruit of which furnishes a solid oil.

TALLY (Fr. *tailler*, to cut), the name given to the notched sticks which, till a recent period, were used in England for keeping accounts in Exchequer, answering the double purpose of receipts and public records. They were well seasoned rods of hazel or willow, inscribed on one side with notches indicating the sum for which the tally was an acknowledgment, and on two opposite sides with the same sum in Roman characters, along with the name of the payer and the date of the transaction. Different kinds of notches, differing in breadth, stood for a penny, a shilling, a pound, £20, £100, and £1000. The tally was cleft through the middle by the deputy-chamberlain with knife and mallet, so that each piece contained one of the written sides, and a half of every notch; and the one half was retained by the payer as his receipt, while the other was preserved in Exchequer. At the union of England and Scotland, a store of hazel rods for tallies was sent to Edinburgh, but never made use of. Act 23 Geo. III. c. 82 abolished the use of tallies in Exchequer, and the old tallies were ordered to be destroyed by 4 and 5 Will. IV. c. 15. The destruction of the Houses of Parliament by fire in 1834 is supposed to have arisen from the overheating of the flues in which the discarded tallies were being burned.

TALLY SYSTEM is the name given to a mode of buying goods much in vogue among the wives of poor men, whereby they get goods, chiefly articles of dress and cheap finery, on credit, or on terms of payment by small weekly sums till the debt is paid. It, in point of law, gives rise to the following hardships or disadvantages whenever, as is usually the case, the wife, in the absence of, and without the knowledge of, the husband, enters into the contract, and purchases goods which are beyond her station. The husband, when sued in such a case on the contract, can set up a good defence. If he had given his wife sufficient clothes, either in specie or the means of buying them, he is not liable to pay any tradesman who, without his sanction, supplies the wife with more, especially if these are articles of finery. It is only in the case of the articles being strictly called necessaries, that he will be bound at all; and as regards women of the lower classes, a court or jury would construe the word 'necessaries' very strictly in favour of the husband. If the articles are extravagant, and beyond the station of the wife, the husband is then not liable to pay for the price, and no court will compel him to do so. The only ground on which he can be made liable will be, that the husband knew of the purchase, and directly or indirectly sanctioned it; as, for example, by seeing her wear the clothes, and not returning them, or giving immediate notice to the tallyman that he objected to the purchase. Nevertheless, it must be confessed that judges are not uniform in their decisions, and some too easily give effect to the contract, for want of strong evidence on the part of the husband of the earliest disavowal of it he could make. The tallyman generally makes it a stipulation that the bargain shall be kept secret for a certain length of time. Nevertheless, if, when it is discovered, the husband at once repudiates and returns the articles, it is the tallyman's own fault if he is then obliged to take them back after they have been partly used, and he cannot fix the husband with liability.

TALMA, FRANÇOIS JOSEPH, an eminent French tragedian, was the son of a dentist, and was born at Paris, 15th January 1763. He made his *début* as an actor in 1787, at the Comédie Française, where he played the part of Séide in *Mahomet*. He achieved considerable success, but apparently not enough to excite any very high anticipations of his future career, and for upwards of a year he figured only in secondary characters. The first thing that induced the public to notice him attentively was an innovation in the matter of costume when playing the part of Proculus in the tragedy of *Brutus*. Previously, actors had worn the garb of their own country, and even their own time; and Roman senators stalked about the stage dressed as Parisian 'swells' of the 18th century. The absurdity of this fashion forcibly struck T., who set himself to amend it, and in the part referred to appeared in the green-room clothed in a Roman toga, greatly to the astonishment of the company, one of whom (Louise Contat) exclaimed: 'Good God! look at Talma; how ridiculous he is! *Why he has quite the air of an ancient statue!*' The compliment was as exquisite and as just as it was unintentional. Henceforth, a rigorous accuracy in costume became a point with T.; but his first grand triumph in acting was won, 4th November, 1789, when he played Charles IX. in Chenier's piece of that name. During the Revolution, he was in the zenith of his popularity, and made peculiarly his own such characters as Abdelazis, in *Abdelazis et Zuléma;* Othello; Néron, in *Epicharis et Néron;* Pharan, in *Abufar;* and Egisthe, in *Agamemnon.* Exceedingly arrogant and choleric, he was often at strife, either with the public or with some of his fellow-actors. T. was a favourite with Napoleon and Louis XVIII. Some of his later characters were among his best, as Marigny, in *Les Templiers;* Leicester, in *Marie Stuart;* Sylla; Oreste in the *Clytemnestre* of Soumet; Leonidas; and Charles VI. He died 19th October 1826.

TA'LMUD (from Heb. *lamad*, to learn)—i. e., Study, by way of eminence—is the name of the fundamental code of the Jewish civil and canonical law, comprising the Mishna (q. v.) and the Gemara (q. v.), the former as the text, the latter as the commentary and complement. We have spoken under HALACHA and HAGGADA of the gradual development of this 'Oral,' or, chronologically speaking, Post-mosaic Code. We have also there mentioned the older collections upon which the Mishna was framed, and finally redacted in the form in which we now possess it. The oldest codification of Halachoth, or single ordinances, is due to the school of Hillel (q. v.). Simon ben Gamaliel the Patriarch

(166 A. D.) and his school carefully sifted the material thus brought together; and in the following generation, through Jehudah Hanassi (219 A. D.) and his disciples, the work was brought to its close in six portions (Sedarim), 63 treatises (Mesichtoth), and 524 chapters (Perakim), which contain the single Mishnas. A summary of its contents is given under MISHNA. But besides this authoritatively compiled code, there were a number of other law collections, partly anterior to it, and not fully embodied in it, partly arising out of it—as supplements, complements, by-laws, and the like—partly portions of the ancient Midrash (q. v.); partly either private text-books composed by the masters of the academies for their lectures or enlargements of the existing Mishna. All this additional legal material was collected, not rarely together with the dissensions which begot it, under the name of *Boraitoth*, by Chia and his school, in the succeeding generation. Not to be confounded with them, however, are the collections of *Toseftas* or *Great Mishnas*, which, commenced at the time of Jehudah Hanassi himself, and continued after his death by Chija and Hoshaja, embody much of what has been purposely left out in the concise Mishna; that only embraced the final dicta and decisions. Such 'additions' we possess now to 52 treatises, forming together 383 Perakim, or chapters. All these different sources of the 'Oral Law'—finally redacted before the end of the 3d c., though probably not committed to writing until 550 A. D.—belong to the period of from about 30 B. C. to about 250 A. D. This great mass of legal matter, although apparently calculated to provide for every case, if not for all times, was yet found insufficient. The dicta of later masters, the decisions of the courts, the discussions on the meaning and purport of special traditions, the attempts at reconciling apparent contradictions in the received material, the amplifications or modifications of certain injunctions rendered necessary by the shifting wants and conditions of the commonwealth—all these and a number of other circumstances made a further codification peremptory.

We must not omit to state here, that this Mishna (Mathnisin), although it contained nothing but what were indigenous laws and institutions, was yet not a little influenced—if the very fact of its redaction was not indeed caused—by the spirit of the times. At Berytus, at Alexandria, at Rome, the legal schools were then in their most vigorous stage of development, and everywhere system and method were being introduced into what till then had been a vast complex of traditional and popular institutions, decrees, and decisions. The Mishna, in all respects, fulfilled the conditions reasonably to be demanded from such a text-book as it was intended to form; it was clear, concise, complete, and systematic, and, moreover, composed in as classical a Hebrew as still could be written in those days of decadence of the 'sacred language.'

The further development of this Supplementary, Oral, or Second Law, in fact, rather an exegesis thereof, together with the discussions raised by apparent contradictions found in the individual enactments of the Mishnic doctors, is called Gemara Discussion, Complement, or, according to another explanation, Doctrine. Whatever the original meaning of the root (*gamar*), it certainly allows of all these significations. This Gamara contains, apart from the Halacha (q. v.), which is generally written in Aramaic, also a vast number of non-legal, chiefly Hebrew, fragments—homiletic matter, tales, gnomes, legends, and the like—called Haggada (q. v.).

There are two Talmuds, the one called the Talmud of the Occidentals, or the 'Jerusalem' (Palestine) Talmud, which was closed at Tiberias, and the other, the 'Babylonian' Talmud. The first of these now extends over 39 treatises of the Mishna only, although it once existed to the whole of the first five *Sedarim* or portions. Its final redaction—falsely attributed to R. Jahanan (died 279)—probably belongs to the end of the 4th c. A. D.; but the individual academies and masters through whom it received its completion cannot now be fixed with any degree of certainty. There is less discussion and more precision of expression in this than in the second or Babylonian Talmud, emphatically styled 'our Talmud,' which was not completed until the end of the 5th c., and which makes use of the former. As the real editor of the Babylonian Talmud, is to be considered Rabbi Ashe, president of the academy of Syra in Babylon (365—427 A. D.). Both the Mishna and the Palestine Gemara had, notwithstanding the brief period that had elapsed since their redaction, suffered greatly, partly by corruptions that had crept into their (unwritten) text through faulty traditions, partly through the new decisions arrived at independently in the different younger schools—of which there flourished many in different parts of the Dispersion—and which were at times contradictory to those arrived at under different circumstances in former academies. To put an end to these disputes, and the general confusion arising out of them, which threatened to end in sheer chaos, R. Ashe, aided by his disciple and friend Abina, or Rabina (abbr. from Rab Abina), commenced the cyclopean task of collecting anew the enormous mass of Halachistic material which by that time had grown up. The method he pursued was simple enough. His disciples met twice a year at Syra, in spring and in autumn. At the spring gathering, he gave out all the paragraphs of one treatise; and the disciples had the task to find out until the autumn meeting what opinions the different schools had pronounced on the special points thereof. He then investigated the whole critically, and put it into shape according to a certain order. This process took him, with the assistance of ten secretaries, no less than thirty years; and another thirty years were spent by him in the revision of the work, with which he proceeded in the same manner as he had done with the compilation itself. The final close of the work, however, is not due, as generally stated, to R. Jose, his successor at the academy (died 475), but to the school of the Saburaim at the end of the 5th century.

The Babylonian Talmud, as now extant, comprises the Gemara to almost the whole of the 2d, 3d, and 4th *Sedarim* (portions), further to the first treatise of the first, and to the first of the last order. The rest, if it ever existed, seems now lost. The whole work is about four times as large as the Jerusalem one, and its 36 treatises, with the commentaries generally added to them in our editions (Rashi and Tosafoth), fill 2947 folio leaves. The language of the Talmud is, as we said, Aramaic (Western and Eastern), or 'Chaldee,' closely approaching to Syriac. The minor idiomatic differences between the two, are easily accounted for by the different time and place; but the additional matter—quotations and fragments from older Midrash and Gemara collections, Haggada, &c.—is, as before stated, principally written in Hebrew.

The masters of the Mishna (Tanaim) and of the Gemara (Amoraim) were followed by the Saburaim (see above). The code of the Oral Law had come to a close with the second named; and not its development, but rather its proper study, elucidation, and carrying into practice, was the task of the generations of the learned that followed. Apart from this, the Aramaic language itself began to die

out as the popular language, and required a further study. The Saburaim no longer dared to contradict, but only opined on the meaning and practicability of certain enactments, and undertook the task of inculcating and popularising the teachings laid down by their sires: apart from bestowing proper care upon the purity of the text itself, and adding some indispensable glosses. Their activity was at its height in the 8th c., when Karaism (see JEWISH SECTS), which utterly denied the authority of the Talmud, sprang into existence. Respecting, however, this authority of the Talmud itself, there has never been anything approaching to a canonicity of the code, or of a reception of it as a binding law-book by the whole nation. The great consideration in which it was always held is owing partly to its intrinsic value, and to the fact of its becoming the basis of all further development of Jewish literature (it being undeniably the most trustworthy receptacle of the traditional Jewish law), and partly to a prosecution against the Jews in the Persian Empire at the time of Jesdegerd II., Firuz, and Kobad, who closed the schools and academies for a space of nearly 80 years, during which this book was the sole authoritative guide of public conscience, and remained endowed with its importance even when the schools were restored. The best commentaries of the Mishna are by Maimonides and Bartenora; of the Babylonian Talmud by Rashi (q. v.) and the *Tosafists* of France and Germany. An abstract of the Talmud for practical (legal) purposes by Maimonides (q. v.) is called Mishne Thorah. The Mishna was first printed at Naples, 1492; the Talmud of Jerusalem at Venice about 1523. The Babylonian Talmud was first published at Venice in 1520. It is generally printed in twelve folios, the text on the single pages being kept uniform with the previous editions, to facilitate the references. No translation of the Gemara has ever been carried further than a few single treatises. The complete Mishna, on the other hand, has been translated repeatedly into Latin, German, Spanish, &c., by Surenhus, Rabe, Jost, and others. We must refrain, in this place, from attempting a general characterisation of the Talmud, a work completely *sui generis*. It will assuredly some day, when properly investigated, prove one of the most important records of humanity. Nothing can give even an approximate idea of the immensity of material, historical, geographical, philological, poetical, that lies hidden in its mounds. A contribution to the records of fanaticism may also be found in the 'exoteric' history of the Talmud, which was, albeit utterly unknown save by a few garbled extracts, prohibited, confiscated, burned, and generally prosecuted and inveighed against by emperors, popes, theologians, and fanatics generally, from Justinian down almost to our own day, as perhaps no other book has ever been. In our own times, however, its value begins to be recognised by great scholars, not merely as the only source of the knowledge of Judaism, but as the chief source—next to the gospels—even for the history of the origin and early days of Christianity; a notion long ago hinted at rather than pronounced by eminent divines like Lightfoot and others. See also JEWS (*Jewish Literature*), MIDRASH, MISHNA, HALACHA, HAGGADA. See a remarkable paper on the *Talmud*, in the *Quarterly Review* for 1867.

TA'LPIDÆ. See MOLE.

TALUS, a term employed in Geology, to designate the sloping heap which accumulates at the base of a rock or precipice, from fragments broken off by the weather, or materials in any way carried over it. The term is also applied to the slope of a wall which diminishes in thickness as it rises.

TAMA'RA SPICE, a favourite mixture of condiments used by the Italians. It consists of powdered cinnamon, cloves, and coriander seeds in equal parts, and half the same quantity of aniseed and fennel-seed powdered.

TA'MARIN (*Midas*), a genus of South American monkeys, small and beautiful, with short muzzle, prominent forehead, long nails, which, except on the hinder thumbs, are formed like claws, the tail longer than the body, not prehensile, and covered with hair so as to resemble the tail of a squirrel. The SILKY T., or MARAKINA (*M. rosalia*), is the best known of the genus. It is of a golden yellow colour, with fine silky hair, of which it is exceedingly careful, to keep it free from stain. It is often brought to Europe, but is very tender, and seldom lives long. It is a very gentle and playful creature. The hair of the head and neck is elongated, so as to form a wig or mane; but this character appears far more strongly in the LITTLE LION MONKEY (*M. leonina*), which inhabits the eastern slope of the

Little Lion Monkey (*Midas leonina*).

Cordilleras, and of which, although it is a very small animal, not many inches long, the appearance is an amusing caricature of that of the lion.

TA'MARIND (*Tamarindus Indica*), a beautiful tree, of the natural order *Leguminosæ*, suborder *Cæsalpineæ*, a native of the East Indies, but now very generally cultivated in warm climates. Only one species is known (*T. Indica*), a spreading tree, 30 or 40 feet high, with alternate pinnate leaves which have from 12 to 15 pair of small leaflets, and fragrant flowers, with three petals, the pods brown and many-seeded, as thick as a man's finger, and about six inches long. The pods are filled with a pleasant, acidulous, sweet, reddish-black pulp. It is brought to Europe, mixed with seeds and fibres, in the form of a mass resembling jam, from the East and West Indies, and the Levant. Tamarinds are generally preserved by throwing hot syrup on the ripe pulp; but a better method is to put alternate layers of tamarinds and sugar in a stone jar, the colour and taste being thus more like those of the fresh pulp. The wood of the T. tree, and especially of its roots, is a cabinet wood of much beauty, but of extreme hardness, so that it is wrought with difficulty.—The pods of some other trees of genera allied to *Tamarindus* are filled with a similar pulp, which is used in the same way, as the T. Plum of India (*Dialium Indicum*), and the Brown and Velvet Tamarinds of Sierra Leone, species of *Codarium*.

On chemical analysis, tamarind pulp is found to contain citric, tartaric, and malic acids; potash, sugar, vegetable jelly, &c. As a salt of copper is a common adulteration, a piece of polished iron (a

knife, for example) should be plunged into the pulp, and left in it for an hour, when, if copper be present, it will be deposited on the iron. Tamarind pulp is refrigerant and gently laxative; and in combination with more active remedies, is often employed in the diseases of children. It is used in India as a cooling article of food, and a kind of sherbet is also formed from it; it is also an excellent addition to curries. Tamarind tea is made by infusing tamarinds in boiling water; when cold, it forms an agreeable and cooling drink in inflammatory or febrile disorders. Tamarind whey is prepared by boiling one ounce of tamarinds with a pint of new milk, and straining: this also is an excellent cooling drink in similar cases.

TA'MARISK (*Tamarix*), a genus of plants of the natural order *Tamaricaceæ*. This order contains rather more than forty known species, all natives of the warmer parts of Europe and Asia, and of Africa, generally growing in arid situations. Some of them are herbaceous, others are shrubs or small trees, with rod-like branches, scale-like leaves, and small flowers in close spikes or racemes. The calyx has four or five segments; the corolla four or five petals; the stamens are hypogynous, equal in number to the petals, or twice as many; the pistil has three styles; the fruit is a one-celled capsule, with numerous hairy seeds. The COMMON T. (*T. Gallica*) grows in sandy places in the countries near the Mediterranean, and has been naturalised in some places on the southern coasts of England. It sometimes attains a height of 30 feet. The twigs seem to possess tonic properties, and their medicinal virtues were once in high repute. The ashes of this and some other species of the genus contain much sulphate of soda.—The ORIENTAL T. (*T. orientalis*) is one of the few trees to be seen in the Arabian and African deserts, with the sands of which it seems to struggle more than any other tree or shrub. Its leafless appearance accords with the surrounding desolation. It is called *atlé* or *ethel*, and its wood is used both for fuel and for many economical purposes. —Galls are found on some species in India, and are valued both for medicinal use and for dyeing. *T. mannifera*, perhaps a variety of *T. Gallica*, yields the kind of Manna (q. v.) known as Mount Sinai manna.—The GERMAN T. (*Myricaria Germanica*) belongs to another genus of this order. It is a smaller shrub than the Common T., and abounds in many parts of Europe and Asia, although not found in Britain. It was formerly supposed to possess valuable medicinal properties, but is now little regarded.

Common Tamarisk (*Tamarix Gallica*).

TA'MBOUR (Fr. *tambour*, drum), a frame upon which muslin or other material is stretched for embroidering. The tambour frame originally was made round. Tambour-work was extensively employed for the decoration of large surfaces of muslin, &c., for curtains and similar purposes; but pattern-weaving has been brought to resemble it so closely, that it is being rapidly superseded.

TAMBOUR, in Fortification, is a small work, usually a timber stockade, about 6 feet high, and loopholed. Its object is to defend a gateway, the road into a village, or to afford flanking fire on a bridge, &c. The tambour on the covered-way is the traverse which closes an entrance from the glacis.

TAMBOURI'NE, a very ancient musical instrument of the drum species, much used by the Biscayan and Italian peasants at their festivities, and sometimes introduced into orchestral music where the subject of the piece is connected with a people who use it, as the Basques, gipsies, or peasants of the Abruzzi. It is composed of a piece of parchment, stretched on the top of a hoop furnished with little bells, and is sounded by the hand, fingers, or elbow. When sharply struck by the hand, the tambourine has not much effect, unless used in numbers. When sounded by gliding the fingers along the parchment, a roll results, in which the bells are chiefly heard; and by rubbing the parchment, without quitting it, with the whole weight of the thumb, the instrument gives out a wild, grotesque sound, which is sometimes of service in masquerade scenes.

TAMBO'V, a government in the south-east of Great Russia, bounded on the E. by the governments of Penza and Saratov. Area 25,542 sq. m.; pop. 1,974,584. The southern districts are hilly; the interior is a somewhat elevated plateau, with a gradual slope toward the north. Several lakes are found in the north of the government, and the principal streams are the Tsna, an affluent of the Moksha, and the Moksha, which is itself an affluent of the Oka. The climate of T., owing to its exposure to the biting north winds, against which there is no protection, is more severe than in neighbouring governments. The soil in the central and southern districts is a rich vegetable mould, and is very productive. In the north, clay predominates, and requires much manure. The chief agricultural products are rye, wheat, buckwheat, oats, hemp, and flax. The larger forests are found in the north, and pasture-lands extend for the most part along the banks of the rivers. Agriculture and cattle-breeding are the principal employments; and some of the breeds of oxen, sheep, and horses are excellent. Cloth, distilled liquors, tallow, and iron are the chief manufactures. The products of the government are exported largely by the Tsna and the Moksha to the Oka and Volga.

TAMBOV, capital of the government of the same name, on the Tsna, 750 miles south-east of St Petersburg. It was founded in 1636 under the Czar Michael Theodorovitch, and served as a fortress against Tartar invasion. It is regularly built, and, though the houses are mostly of wood, there are several important institutions, as the college, the military hospital, &c. T. is the seat of considerable manufacturing trade, there being in all 28 factories, in which cloth and sailcloth are extensively made. The chief articles of trade are leather, wool, tallow, and salt beef. Pop. 29,356.

TAME ANIMALS, in point of law, render their owners subject to certain liabilities. There is no restriction as to what wild animals may be tamed; and the person who tames one, and retains possession, becomes the owner of it. There is, however, in all such cases an obligation on the owner

to keep the animal with due care; and if it tends to be a nuisance to a neighbourhood, he would, in extreme cases, be liable to an indictment, or in most cases, to an action of damages. If the animal tamed is naturally ferocious, then it is incumbent on the owner to keep it secure, so as not to allow it an opportunity of doing mischief; and in case of accidental escape, it is seldom that a jury will be persuaded that the owner is not guilty of negligence, and liable for the damage done. There is a certain class of animals which may exist in a wild state, yet by long use, or a second nature, have become domesticated, such as dogs and cats, and are called *mansuetæ naturæ*, in contradistinction to ferocious animals, such as lions. With regard to animals *mansuetæ naturæ*, the rule is, that the owner is only liable for mischief done by such animals when he has been guilty of some negligence in keeping such animals; and in practice this amounted to saying, that, if the owner was ignorant that the animal had once before done similar mischief, he would not be liable, unless he had omitted to take some care to restrain that evil propensity. Thus, if a dog or cat, from some sudden whim, chose to attack some person, or other animal, not being incited to it by the owner, such owner is not at common law liable for the first offence; but in case of a second offence, he was generally held liable, at least whenever there was evidence of slight negligence superadded. Hence, if a dog worried sheep casually, the owner was held to be not liable, if it was the first offence. This state of the law was, however, found to work harshly, and a statute passed first for Ireland, then for Scotland, and lastly for England, the effect of which is to make the owner of a dog liable for damages caused by its worrying sheep, even though it is the first offence, and though the owner was not guilty of any negligence. These statutes passed in 1862, 1863, and 1865 respectively, and they establish an exception to the general rule, which still is in force, as to mischief done by dogs, other than worrying sheep—namely, that before the owner can be made liable, it must be proved that he knew of the dog or cat's mischievous propensity to do the act in question, and did not use due care in restraining it. This is the rule where, for example, a dog bites a person, or a bull gores a passenger. In short, negligence is the gist of the action, and more than mere ownership must be proved against the owner. Sometimes owners of lands plant spring-guns, traps, and similar implements, with a view to kill dogs, cats, and other vermin straying in such fields. The practice of placing spring-guns and man-traps, with a view to kill poachers, was found once to prevail, and created a great outcry about forty years ago; and the legality of the practice was questioned, but the judges in England held, that if the man injured was a trespasser, the owner of the land was not liable; consequently, a statute was passed to make it illegal in future to place such engines, except in, and close to, dwelling-houses. In Scotland, the judges held that the practice was illegal at common law, and no statute was necessary. But though man-traps put in fields are now illegal, traps which destroy dogs or cats are not so, with this qualification, however, that the traps must not be put near a highway, where the dog or cat might be lured aside when lawfully passing, as this would be taking too great an advantage of the instincts of the animal. As regards the stealing of tame animals, it was a technical defect in the common law of England that the offence of larceny could not be committed upon them; but by statutes, it is provided that in most cases the offence of stealing or destroying tame animals is punishable either by fine or by imprisonment, in much the same way as larceny is punishable.

TAMERLANE. See TIMÛR.

TAMIL′ (more properly spelled *Tamir′*, but erroneously written *Tamul*, and erroneously termed by the earlier Europeans 'the Malabar') is the name of the language earliest cultivated of all the idioms which the Rev. R. Caldwell designates as Dravidian—this term comprising, according to him, besides the Tamil, the Telugu; Canarase; Malayâlam, or Malayârma; Tul′u, or Tul′uva; Toda, or Tuda, or Tudava; Kôta; Gônd; and Khond, or Kund, or Ku. 'The Tamil language,' this learned author says in his *Comparative Grammar of the Dravidian or South-Indian Family of Languages*, 'is spoken throughout the vast plain of the Carnatic, or country below the Ghauts, from Pulicat to Cape Comorin, and from the Ghauts, or central mountain-range of Southern India, to the Bay of Bengal. It is also spoken in the southern part of the Travancore country, on the western side of the Ghauts, from Cape Comorin to the neighbourhood of Trivandrum; and in the northern and north-western parts of Ceylon, where Tamil′ians commenced to form settlements prior even to the Christian era, and from whence they have gradually thrust out the Singhalese. All throughout Ceylon, the coolies in the coffee-plantations are Tamil′ians; the majority of the money-making classes even in Colombo are Tamil′ians; and ere long, the Tamil′ians will have excluded the Singhalese from almost every office of profit and trust in their own island. The majority of the domestic servants of Europeans, and of the camp-followers in every part of the presidency of Madras being Tamil′ people, Tamil′ is the prevailing language in all military cantonments in Southern India, whatever be the vernacular language of the district; hence, at Cananore, in the Malayâla country; at Bangalore, in the Canarese country; at Bellary, in the Telugu country; and at Secunderabad, where Hindustani may be considered as the vernacular, the language which most frequently meets the ear in the bazaar is the Tamil′. The majority of the *Klings*, or Hindus who are found in Pegu, Penang, Singapore, and other places in the further east, are Tamil′ians. . . . . Including Tamil′ians resident in military stations and distant colonies, and the Tamil′ian inhabitants of South Travancore and Northern Ceylon . . . . the people who speak the Tamil′ language may be estimated at *about ten millions*.' 'Tamil′ includes two dialects, the classical and the colloquial, or the ancient and the modern, called respectively the Shen-Tamil′ and the Kod′un-Tamil′.' The former is the language of poetry and of the ancient inscriptions; it contains fewer words borrowed from the Sanscrit than the colloquial Tamil′, and among these chiefly such as express abstract ideas of philosophy, science, religion, and technical terms of the more elegant arts; and, in general, it so considerably differs from the colloquial Tamil′ that it is almost unintelligible to the unlearned Tamil′ian. Of all the Indian languages, Tamil′ has the most imperfect alphabet. The latter consists of 12 vowels—viz., *a, â, i, î, u, û, e, ê, o, ô, âi*, and *au*—and of 18 consonants—viz., *k, ch, t′, t, p, R, ng, ñ, n′, n, m*, a final *n, y, r, l, v, r′, l′*. Compared to the Devanâgarî alphabet of Sanscrit, it is deficient therefore in the vowels *r′i, r′î*, and *lr′i*, though it possesses a short *e* and a short *o*, which the Devanâgarî has not; it has but one sound for *k, kh, g, gh*; for *ch, chh, j, jh*; for *t′, t′h, ′d, ′dh*; for *t, th, d, dh*; and for *p, ph, b, bh*. It is destitute, moreover, of the Sanscrit aspirate *h*, of the Sanscrit sibilants, *s, s′* and *sh*, and of Anuswa′ra and Visarga. Of combined consonants, which abound in the Devanâgarî

alphabet, it admits only the junction of the nasal and the mute, as *n-t*, *n'-t'*, &c.; doubled nasals, as *n-n*, *m-m*, &c.; doubled surds, as *k-k*, *ch-ch*, &c.; also *t'k*, *t'p*, *Rk*, *Rch*, *Rp*, *yy*, *ll*, *vv*, and *nR*; of triple consonants, only *r'nd* and *ynd*. If Sanscrit derivatives, therefore, are Tamil'ised, various devices are resorted to in order to separate Sanscrit groups of consonants. Thus, Sanscrit *pra* becomes Tamil' *pira*; Sanscrit *kr'ishn'a* becomes Tamil' *kirut't'ina-n* or *kit't'ina-n* (*t't* instead of *sh*).

The earliest history of the Tamil' country is still involved in obscurity. From evidence afforded by the language, Dr Caldwell has drawn a sketch which would tend to shew that the un-Aryanised Tamil'ians had 'kings,' who dwelt in 'fortified houses,' and ruled over small 'districts of country;' that they had 'minstrels,' who recited songs at festivals; but that they were without 'hereditary priests,' without 'idols,' and ideas of 'heaven, hell, soul, or sin;' yet that they acknowledged the existence of God, whom they styled *kô*, or king, and erected to his honour a temple which they called *kô-il*, or God's house. Their chief worship, however, seems to have consisted in bloody sacrifices which they offered to 'the devil.' Dr Caldwell further shews that they were acquainted with the ordinary metals, except tin and zinc, and with the planets known to the ancients, except Mercury and Saturn; that they had medicines, hamlets, towns, ships, and practised the necessary arts of life, such as cotton-weaving and dyeing, though none of the arts of the higher class, as painting, sculpture, &c.; that they knew no astronomy, and were ignorant of philosophy and grammar. The earliest civilisation of the Tamil'ians is traditionally attributed to the influence of successive colonies of Brahmans from Upper India; and the leader of the first colony is said to have been the Rishi (q. v.) or saint *Agastya*, a personage who plays an important part in Brahmanical legends. He is called the first king of the Pândîya kingdom, which was situated near the southern extremity of the peninsula; and by the majority of orthodox Hindus he is believed to be still alive, though invisible to ordinary eyes. His era is supposed to belong to the 6th c. B. C.; though, like all other ancient Hindu dates, this date, too, cannot be fixed with any degree of certainty. Whether the Vedic worship (see VEDA) was ever known in the Tamil' country, may be matter of doubt; the worship introduced by the Brahmans seems, on the contrary, to have been that based on the incarnations of Vishn'u (q. v.) and S'iva (q. v.), and therefore to belong to an advanced stage of Hinduism. Vaishn'avas, S'aivas, and S'âktas (see INDIA) are the now prevalent sects of the Tamil' country; for the Jainas (q. v.), who flourished in the Pândîya kingdom, probably from the 8th or 9th c. to the 12th or 13th after Christ, were finally expelled from it; and only a few adherents of this sect may now be met with there.

The oldest Tamil' works are, however, those written, or claimed to have been written, by the Jainas; and it is a remarkable fact, that at any period of Tamil' literature few Brahmans have contributed anything to it that may be deemed worthy of preservation. The finest composition which Tamil' possesses is the *KuRal'* of Tiruval'l'uvar, 'a work consisting of 1330 distichs or poetical aphorisms, on almost every subject connected with morals and political economy.' Dr Caldwell holds that it is not later than the 9th c. after Christ. A commentary on this work by Parimelar'agar is the most classical production which has been written in Tamil' by a Brahman. Besides the *KuRal'*, the following works are said to have received the sanction of the Madura College, which, according to tradition, founded by Vam's'a S'ekhara for the cultivation of the Tamil' language and literature, was then probably the most celebrated seat of learning in all Hindustan. Their names are: *Naladiyar*, *Nanmanikkadikai*, *Iniyavai Narppatu*, *Inna Narppatu*, *Kar Narppatu*, *Kallavali Narppatu*, *Tokai*, *Tirikadukam*, *Asara Kovai*, *Pala Moli*, *Siru Pansa Mulam*, *Mutu Moli Kanji*, and *Elati*. For a list of other and later works written in Tamil', both medieval and modern, embracing the topics of Religion—Protestant theology, Roman Catholic theology, Hinduism, and books published by Mohammedans—Jurisprudence, Philosophy, Science, Arts, Literature, Philology, Geography and History, Periodicals and Newspapers, see the very useful *Classified Catalogue of Tamil' printed Books, with Introductory Notices*, compiled by John Murdoch (Madras, 1865); and for learned purposes, the invaluable *Comparative Grammar of the Dravidian or South-Indian Family of Languages*, by Rev. R. Caldwell (Lond. 1856).

TA'MMERFORS, a town in the south of Finland, 250 miles (direct line) west-north-west of St Petersburg. It is situated on a rapid which connects two lakes, and affords motive-power to the extensive cotton-mill of Messrs Notbek & Co., in which 30,000 spindles and 550 looms are in constant operation, and 1566 persons are employed. Pop. 5538.

TA'MMUZ, a word which occurs once in the Bible—viz., Ezek. viii. 14: 'And, behold, there sat women weeping for Tammuz.' The derivation of the word is as problematic as is the meaning itself. The Vulgate (all the other versions give the word unchanged—thereby confessing the universal ignorance on the subject) has Adonis, and this has indeed been accepted as the most credible explanation of this strange name. It probably means the Phœnician god Adonis, whose chief temple and worship was at Byblus, but who at an early period had been introduced into Syria, Cyprus, and Greece, where he was connected with Aphrodite. His festivals were partly the expressions of joy, partly of mourning. In the latter, the women gave themselves up to the most unmitigated grief over the 'lost Adonis,' shaved off their hair, and sacrificed their chastity in his temples. The days of mourning were completed by a solemn burial of an image of the god. This period was followed by a succession of festive and joyful days, in honour of the resurrection of Adonis. The river Adonis (Nahr Ibrahim) (see PHŒNICIA), which once a year 'ran purple to the sea' from the Lebanon, was supposed to be tinged by the blood of the god; and a vessel sent off from Alexandria, and carried by the tide to Byblus, used to inform the mourners by letter that he had been found again. There is no doubt that the different phases of the year, or rather the disappearance and reappearance of the enlivening rays of the sun, and their influence upon all nature (see OSIRIS), were symbolised in these originally poetical, afterwards licentious and fanatical rites. The time of the year at which these feasts were celebrated, has given rise to much dispute. Most probably, they took place at the summer solstice, and the designation of a Hebrew month as Thamuz—which falls about our August—seems further to favour this opinion.

TAMMY, a thin worsted stuff, highly glazed. It is much used for ladies' boots, under the name of *Lasting*; it is also called *Durant*. It is also used, undyed, to form sieves for use in cooking, to strain sauces. Such sieves are called Tammies, or Tamis.

TAMP, TAMPING. See MINES and BLASTING.

TAMPAN, a Tick (q. v.) of South Africa,

remarkable for its very poisonous bite, found in Angola and the country southward from it, and described by Livingstone in his *Travels.* It attacks by preference the parts between the fingers or toes. It attains the size of a pea, and when it has satiated itself with blood, is of a dark-blue colour, and its skin so tough, that it cannot be burst by squeezing with the fingers. The first effect of the bite is a mingled sensation of pain and itching, which ascends the limb until it reaches the abdomen, and soon causes either violent vomiting and purging, or fever. The tingling sensation lasts for a week.

TAMPI'CO, or Santa Anna de Tamaulipas, a seaport of Mexico, in the state of Tamaulipas, on the Panuco, 5 miles from its mouth in the Gulf of Mexico. Its streets are broad and regular, and among other institutions it contains a custom-house. At the mouth of the river is a dangerous bar, and the harbour is unsafe. Hides, tallow, bones, and salted meat are exported to Great Britain and the United States. In 1864, the imports amounted to £668,404; the exports—greatly reduced within recent years by the state of anarchy and confusion into which the country has been plunged—to £235,473.

TA'MPION, the wooden plug placed in the mouth of a piece of ordnance to preserve it from dust and damp.—In Naval Gunnery, the tampion is the wooden bottom for a charge of grape-shot.

TAM-TAM, an Indian musical instrument, resembling the Tambourine (q. v.), but larger and more powerful, and oval instead of round. It has been occasionally introduced into orchestral bands.

TAMUS. See BRYONY.

TA'MWORTH, a parliamentary and municipal borough, partly in the county of Stafford, partly in that of Warwick, at the confluence of the Tame and Anker, 7 miles south-east of Lichfield. Of the ancient church, the transepts are Norman; the remains of the ancient castle, to which modern additions have been made, are in various styles. Brickmaking, brewing, dyeing, wool-stapling, and manufactures of tapes and small wares are carried on. There is a bronze statue to the late Sir Robert Peel, erected in 1852. Pop. (1881) of municipal borough, 4888; of parliamentary borough, 14,098.

TA'NAGER (*Tanagridæ*), a family of birds related to the Finches (*Fringillidæ*), having a conical beak,

Tanager (*Pyranga rubra*).

triangular at the base; the upper mandible notched towards the tip, and its ridge arched. The species are numerous, and the Linnæan genus has been divided into a number of genera, all of which possess the characters just given, and popularly receive the name Tanager. All of them are American, and most of them belong to warm regions; but some visit more northern parts of America as birds of passage. Many of the tanagers are birds of very beautiful plumage, and many have good powers of song. The ORGANIST T. (*T.* or *Euphonia musica*) is particularly famous for its rich full tones.

TANANARIVA'. See ANTANANARIVA.

TAN-BALLS. A useful way of utilising the spent bark of the tanner's yard has been adopted in many parts of England: it consists in pressing the bark into balls or lumps, which harden on drying, and serve for fuel.

TANCRED, a Sicilian prince, the son of Eudes, a Norman baron, and of Emma, the sister of Robert Guiscard (see GUISCARD), was one of the celebrated heroes of the first crusade, and was born after the middle of the 11th c. A.D. Some chroniclers profess to detail the events of his early life, describing him as the most accomplished youth of his time in athletic and military exercises, and of a wisdom far surpassing that of men of mature years, and as a partisan of his cousin Bohemond (q. v.) in the quarrel with their uncle, Roger (q. v.) of Sicily. But the first authentic information respecting him is that he raised a large body of men in Apulia and Calabria, and joined Bohemond, then on his way to the first crusade. The two cousins landed in Epirus, and first one and then the other made their submissions to the Greek emperor, Alexis. T.'s exploits on the way to Syria; his quarrel with Baldwin for the possession of Tarsus, and his subsequent chivalrous forbearance to, and rescue of, his rival; his wondrous valour before Antioch, where he killed no fewer than 700 infidels, transmitting the heads of 70 to the pope, and receiving a corresponding number of marks of silver in return; his vigorous repulse of the first sortie by the infidels from Jerusalem; his sad and lonely vigil on the Mount of Olives; and his gallantry at the storming of the sacred city, are all detailed by the numerous chroniclers of this epoch, in their usual style of extravagant laudation, but with a harmony which speaks favourably for their correct appreciation of his character. He was one of the claimants of the throne of Jerusalem, and was pacified by Godfrey (q. v.), the successful competitor, with the gift of some towns in Palestine, and the principality of Galilee or Tiberias. A brief quarrel with Baldwin, after Godfrey's death, petty combats with the infidels, and occasional wars with the other Christian princes who had settled in Syria and Palestine, occupied the remainder of his life, which was brought to a close at Antioch in 1112. Besides his own principality, he governed that of Antioch, belonging to his cousin Bohemond, from 1100. The fiery and energetic, but at the same time pious, sagacious, and forbearing chief whom the chroniclers present to us, has been considerably toned down by Tasso in his *Gerusalemme Liberata.*

TANGANYIKA, a lake of Eastern Central Africa, the northern end of which is 200 miles south-west of Victoria Nyanza. It lies between lat. 3° and 7° 45' S., long. of centre, 30° E.; surface, 1844 feet above the level of the sea; length, 320 miles; breadth, from 15 to 60 miles. In shape it resembles a leech, tapering towards the north. The explored portion, on the north-east, has elevated and populous shores. The water is fresh and deep. It was discovered by Captains Speke and Burton in 1858, when they arrived on its eastern shore, at Ujiji, about lat. 5° S. It has not been ascertained whether a supposed river flows into or out of its northern extremity.

TANGENT. See TRIGONOMETRY.

TA'NGHIN (*Tanghinia venenifera*, or *Cerbera Tanghin*), a tree of the natural order *Apocynaceæ*, a native of Madagascar. The fruit is a drupe, of which the kernel is so deadly a poison, that although not larger than an almond, one kernel is sufficient to destroy twenty people. It was used in Madagascar as an ordeal for the discovery of guilt or innocence, and with the general result of the death of those subjected to it. A little of the powdered kernel was placed on the tongue of the suspected person, and he was obliged to swallow it. Only those recovered whose stomachs quickly rejected the dose. The progress of Christianity and civilisation in Madagascar has led to a discontinuance of the use of this ordeal. A similar poison-ordeal is used in some parts of Africa. See ORDEAL and ERYTHROPHLÆUM.

TANGIE'R, a seaport of Morocco, on a small bay or inlet of the Straits of Gibraltar, 38 miles south-west of the town of that name. It is a small, ill-built town, situated on two hills; the houses—with the exception of the residences of foreign officials—being, as a rule, miserable edifices, and the streets being narrow and dirty. The town is surrounded by old walls, and protected by several forts. In 1863, 920 vessels, of 92,476 tons, and with cargoes the value of which amounted in all to £587,247, entered and cleared the port. T. was taken by the Portuguese in 1471, and ceded to the English in 1662, and held by them for 22 years. Pop. about 9500.

TANGLE, the common name of *Laminaria digitata* and *L. saccharina*, two species of sea-weed, natives of the British shores, growing on rocks in deep water. The stem is woody, the frond leathery, flat, and without a midrib. The woody stems are sometimes used for knife-handles, the blade being stuck in when the handle is soft, and held fast by its shrinking as it dries. The young stalks form an article of food, and are nutritious, owing apparently to the large quantity of gelatinous matter which they secrete. They are also used for feeding cattle. *L. potatorum*, a large species, supplies the aborigines of Australia with instruments, vessels, and food.

TANIS, the Tyrian name of the goddess Astarte (q. v.).

TA'NISTRY, an ancient Celtic custom of succession, which is generally described as devolving the right to inherit lands or honours on the oldest and worthiest of the blood. The tanist, or righdomna, was the heir-apparent of the monarchy, whom it was the practice to appoint during the lifetime of the sovereign; and there is no doubt that the nearest to the original stock was held to have a preferable claim, as contended by Bruce in his claim to the Scottish throne. The practice of electing a successor was also applied to the inheritance of land, and to succession to ecclesiastical offices.

TANJU'R, more commonly written TANJORE, an important town of India, in the presidency of Madras, 180 miles south-south-west of the city of that name, in the midst of an extensive plain, on one of the branches of the delta of the Kaveri. The town comprises two forts and several suburbs. The former are so connected that they may almost be regarded as one. The smaller of the two is a parallelogram in shape, and 600 yards in extreme length. It is joined on the north to the larger fort, which is circular in shape, and 1100 yards in greatest diameter. The walls of both are lofty and strong, and are surrounded by a ditch cut out of the solid stone. The principal edifices of T. are the Great Pagoda, esteemed the finest specimen of a pyramidal temple in Hindustan (see INDIAN ARCHITECTURE), and the palace of the rajah. Silks, muslins, and cottons are manufactured. Pop. about 90,000.—The province of Tanjûr, of which the town of the same name is capital, has an area of 3900 sq. m. and contains 1,676,100 inhabitants.

TANK-WORMS. The mud in Indian tanks has been found to abound in *Filariæ*, some of which closely resemble the guinea-worm infesting the human body. Although there is no positive evidence, there is extreme probability that these tank-worms are the origin of the guinea-worm. Dr. Carter, who has had much personal observation of the guinea-worm in India, 'argues, and apparently with good reason, *No tank-worm, no guinea-worm*. Persons who bathe in water in which the former is found may expect to have the latter.' Mr Bastian, who has written an excellent paper on the anatomy of the guinea-worm, states that there is an undoubted anatomical relation between it and the tank-worm. The real difficulty in the theory is that these tank-worms are widely diffused, while the guinea-worm is restricted in its localisation.

TANNAHILL, ROBERT, was born on the 3d June 1774, at Paisley, where his life was almost entirely passed in the humble occupation of a weaver. Very early he exhibited a taste for poetry, and out of his constant study of the works of Burns, Fergusson, and Ramsay, the ambition was developed in him of emulating these favourite authors. His poetry soon became known, and procured him a local celebrity, which, on the publication, in 1807, of a collection of his pieces (*Poems and Songs*; new and larger ed., with a memoir of the author, Glasgow, 1838), was ratified by a wider acceptance. But whilst his modest fame was extending itself, his life had an abrupt termination. He was found one morning (May 17, 1810) drowned in a canal near Paisley; and there seems almost no reason to doubt that his death was that of the suicide. A morbid melancholy which seems to have been inherent in his nature had gradually been growing upon him, and clouding his life with hopeless gloom. He died at the age of 36.

As a song-writer, T. continues to be remembered; and some few of his best pieces have established themselves as part of the musical repertory of the Scottish people. He has a genuine lyrical gift, much tenderness of sentiment, and a true eye and feeling for the simple effects of nature with which he was familiar. Of the force and passion of Burns, he has nothing; but in grace and sweetness, Burns himself has scarcely perhaps surpassed certain of his happier passages.

TANNHÄUSER, the subject of one of the most attractive German legends of the middle ages, is a knight who, in the course of his travels, comes to Venusberg (q. v.), and enters the cave-palace, to behold the wonders of the Lady Venus and her court. After having lived there for some time in every kind of delight, his conscience smites him. Invoking the Virgin Mary, he obtains leave of absence, and makes a pilgrimage to Rome, to Pope Urban, to seek, through confession and penance, remission of his sins, and escape from damnation. But the pope, who happens to have a wand in his hand, tells him that he can as little obtain God's mercy as that dry wand can become green again. Thereupon, T. departs in despair, and returns to the Lady Venus in the mountain. Three days afterwards, however, the wand begins to sprout and bear green leaves; and the pope immediately sends out messengers to every country, but in vain—T. can nowhere be found. Such is the story, as told in the popular ballad once common all over Germany, and even beyond it, and sung in the district of Entlibuch as late as the year 1830—the best version of which is in Uhland's *Alten hoch- und niederdeutschen*

Volksliedern (Stuttg. 1845). In the preface of the *Heldenbuch*, it is further added, that 'the faithful Eckhart'—a character in German heroic legends—sits before the mountain, and warns the people of its dangers. In this shape, the story may be traced as far back as the 14th c.; but the substance of the legend is much older, and goes back to the days of German paganism. Some traditions connect it with the Hoselberg or Hörselberg, near Eisenach, in which the Lady Holle or Holda (see BERCHTA) held her court, who, on her part again, seems to be identical with Freyja, the Scandinavian Venus. The peculiar mythological meaning of the saga, which has numerous points of contact with many other German traditions, has, however, never yet been thoroughly inquired into. Grimm sees in it a touching portrayal of the regret that lingered in the popular heart after the departing paganism, and of the sternness of the Christian priesthood in regard to it. Compare Kornmann, *Mons Veneris* (Fkf. 1614); Grässe, *Die Sage vom Ritter Tannhäuser* (Dres. and Leip. 1846). In later times, the saga has been put into poetical form, among others by Tieck, and made use of by R. Wagner in an opera. This idea of subterranean palaces in which the king or queen of dwarfs, pigmies, fairies, and so forth, held their court, seems to have been universal. Everywhere, stories are told of men being enticed to enter, and finding it difficult or altogether impossible ever again to obtain their liberty. See RHYMER, THOMAS. The visit of Ulysses to the isle of Calypso, and that of Circe, appear to be only modifications of the same idea.

About the middle of the 13th c., and contemporary with Pope Urban (Urban IV., 1261—1265), there lived in reality in Germany a Bavarian knight named Tannhäuser, who, as Neidhart relates, after returning from the wars, resided as Minnesinger (q. v.) at the court of the Austrian Duke Frederick II. the Quarrelsome. At the duke's death, and after having wasted his substance in dissipation, he resided partly with Duke Otto II. of Bavaria, and partly led a wandering life. T. has composed fine spirited ballads, which, however, shew the decay that had already set in in the Minnesinger's art. T.'s memory was held in high regard by the Meistersingers, who also preserved one of his measures; and it is quite possible that this T. may have been introduced into popular fiction, and have had his name worked into a myth, in which there is some resemblance to his actual fortunes; in which process, however, that old myth became transformed into the more modern saga. The poems of T. are published partly in the second part of the *Minnesinger* (published by Von der Hagen, Leip. 1838), and partly in the sixth vol. of Haupt's *Zeitschrift für deutsches Alterthum* (Leip. 1848).

TA'NNIC ACID, or TANNIN. Under these synonymous terms, chemists include a number of solid non-nitrogenous substances, consisting of carbon, hydrogen, and oxygen, some of which are crystalline, and others amorphous, and possessing no smell, but a well-marked astringent taste. They are soluble in water and alcohol, the solutions being acid, and yielding precipitates with most metallic oxides. A solution of gelatine is also precipitated by a solution of any of the tannic acids, and the gelatigenous tissue in raw hides is by an analogous process converted into leather. See GALLOTANNIC ACID. None of these acids are volatile; and when exposed to the action of heat, they decompose, and yield the so-called pyro-acids. The persalts of iron yield bluish-black or green precipitates with the tannic acids.

The members of this group are widely diffused throughout the vegetable kingdom. 'The bark and leaves of most forest trees, such as the oak, the elm, the willow, the horse-chestnut, and the pine—and of many fruit trees, such as the pear and plum, contain tannin in notable quantity. The wood and bark of many shrubs, such as the sumach and whortleberry, and the roots of the tormentilla and bistort, are also powerfully astringent, owing to the presence of one of the forms of tannin. Coffee and tea, as well as Paraguay tea, likewise contain a modification of this principle. All these bodies, except coffee, precipitate the persalts of iron of a bluish-black colour; or, if a free acid be present, the solution assumes a dark-green colour.' —Miller's *Organic Chemistry*, 2d ed. p. 400. The variety of tannin, or tannic acid, occurring in catechu and kino, produces a green precipitate with the persalts of iron; while that occurring in matricaria, rhatany, and the common nettle, produces a gray precipitate. The principal members of this group are—1. *Gallotannic acid*, or *Tannic acid*, $C_{27}H_{22}O_{17}$ (in the ordinary acceptation of the word), which is mainly obtained from the gall-nut, and has been described in a special article; 2. *Morutannic acid*, $C_{13}H_{10}O_6$, obtained from fustic (*Morus tinctoria*); 3. *Quinotannic acid*, $C_{42}H_{30}O_{35}$, obtained from cinchona bark; 4. *Quercitannic acid*, from oak bark; 5. *Mimotannic acid*, $C_{18}H_{18}O_{28}$, from catechu; and 6. *Kinotannic acid*, from kino; to which some chemists add a variety occurring in coffee and Paraguay tea, to which the term *Caffotannic acid* is given.

TANNING. See LEATHER.

TANSY (*Tanacetum*), a genus of plants of the natural order *Compositæ*, sub-order *Corymbiferæ*, allied to *Artemisia* (q. v.), and having hemispherical heads of flowers, with the florets all tubular, the receptacle naked, the pappus a slight membranous border. The species are pretty numerous, and are natives of the temperate parts of the Old World. COMMON T. (*T. vulgare*) is a native of Britain and of Continental Europe, growing in fields and by roadsides, river-banks, &c. It has long been generally cultivated in gardens. It is now naturalised,

Tansy (*Tanacetum vulgare*).

and pretty common, in many parts of North America. It is a perennial, from two to four feet high, with great abundance of deep-green, bipinnatifid, inciso-serrate leaves; the flowers in terminal corymbs, yellow, and rather small. The leaves and flowers have a strong aromatic smell and a bitter

taste. The young leaves are used for flavouring puddings, cakes, omelets, &c. The plant is also tonic and anthelmintic, and *Tansy tea* is an old popular medicine. Some curious old customs still linger in many parts of England connected with the use of *Tansy cakes* and *Tansy puddings* at Easter, which was originally intended to represent the use of bitter herbs at the Paschal feast. In some parishes of the counties of Devon and Dorset, the clerk carries round to every house a few white tansy cakes as an Easter offering after divine service on Good Friday, and receives a gratuity from each householder. In former times, both ecclesiastics and laics played at ball in the churches for tansy cake at Easter-tide. The highest dignitaries took part in this, and began the ball-playing, which went on during the antiphone, and was accompanied with dancing. After the ball-playing was over, all retired for refreshments; and a gammon of bacon was a standard dish, to signify abhorrence of the Jews. A tansy pudding was an essential part of the feast.—See Chambers's *Book of Days*.

TA'NTALUM (symb. Ta, equiv. 182) is a very rare metal, discovered in 1802 by Ekelberg in the Swedish minerals known as tantalite and yttrotantalite. It is so closely allied to columbium or niobium, that Wollaston regarded the two metals as identical, a view which was generally adopted till Rose disproved it. As it is of no practical importance, it is unnecessary to enter into any details regarding it.

TA'NTALUS, a character noted in Greek mythology for the punishment he suffered in the lower world. He is said to have been the son of Zeus by Pluto, and some accounts describe him as king of Argos or Corinth. Various reasons are assigned for his undergoing the severe punishment which he did, the most common being, that he divulged the divine counsels of Zeus, which the latter had communicated to him as secrets. In the lower world, he was afflicted with an insatiable thirst, and had to stand up to the chin in a lake, the waters of which receded whenever he tried to drink of them. Clusters of fruit hung over his head, which eluded his grasp whenever he endeavoured to reach them, his mind at the same time being kept in a state of constant terror lest a huge rock, suspended above his head, and ever threatening to fall, should crush him. T., or rather the punishment which he suffered, has supplied the English language with the very significant verb, 'tantalise.' T. was the father of Pelops, Broteas, and Niobe.

TANTALUS, a genus of birds of the family *Ardeidæ*, resembling storks in their feet and bill, except that the ridge of the bill is rounded, and its tip gradually curved downwards, and slightly notched on each side; a portion of the head, and sometimes of the neck, is bare. The AFRICAN T. (*T. ibis*) was long regarded as the Ibis (q. v.) of the ancient Egyptians, but it is rare in Egypt, and belongs chiefly to Senegal. It is much larger than the true ibis. The AMERICAN T., or WOOD IBIS (*T. loculator*), is as large as a stork, but more slender, white, with black quill and tail feathers, the naked skin of the head and neck black. It is found both in North and in South America. In the United States, it chiefly inhabits the swampy districts of the south.

TANTRA (from the Sanscrit *tan*, to believe, to have faith in; hence, literally, an instrument or means of faith) is a name of the sacred works of the worshippers of the female energy of the god S'iva. See S'ÂKTAS. A Tantra is said to comprise five subjects—the creation and destruction of the world, the worship of the gods, the attainment of all objects, magical rites for the acquirement of six superhuman faculties, and four modes of union with spirit by meditation. A variety of other subjects, however, are introduced into many of them, whilst some are limited to a single topic, as the mode of breathing in certain rites, the language of birds, beasts, &c. They always assume the form of a dialogue between S'iva and his wife, in one of her many forms, but mostly as *Umâ*, or *Pârvatî* (q. v.), in which the goddess questions the god as to the mode of performing various ceremonies, and the *mantras*, or prayers and incantations to be used in them. These he explains at length, and under solemn cautions that they involve a great mystery, on no account whatever to be divulged to the profane. The efficacy of these *mantras* is deemed to be all-powerful, and according to some Tantras, that of the faith in these revelations of S'iva so great, as to free a believer from the consequences of even the most atrocious sins. The followers of the Tantras profess to consider them as a fifth Veda (q. v.), and attribute to them equal antiquity and superior authority. Though such an antiquity, or even one approaching the age of the four Vedas, is entirely imaginary, the question of their date is nevertheless involved in obscurity. As Tantras are referred to in some of the *Purân'as* (q. v.), they must have preceded these; but as, on the one hand, the age of the Purân'as themselves is merely conjectural, and as there probably existed older Purân'as than those we possess now; and, on the other hand, as there might likewise have been older Tantras, from which the works now so called were compiled, the circumstance that Tantras are quoted by some Purân'as would not throw much light on the date of those now extant. It seems more significant, however, that the oldest known author of a glossary of classical words, Amarasinha (see *Lexicography*, under SANSCRIT LITERATURE), should have omitted from amongst the meanings he assigns to the word *tantra*, that of 'a sacred book;' whereas the later commentators on his work do not fail to supply this omission, which certainly would have been an extraordinary one had Tantras existed at the time of Amarasinha. If, then, this negative evidence has the value which it seems to have, the Tantras would, at all events, be later than the first centuries of the Christian era. The works of this class are very numerous, and it is to be regretted that Sanscrit philology, which has already investigated, more or less profoundly, nearly all the branches of Sanscrit literature, should hitherto have almost entirely neglected this particular branch of it. The principal Tantras are the *S'yâmârahasya*, *Rudrayâmala*, *Mantramahodadhi*, *S'âradâtilaka*, and *Kâlikâtantra*.—See H. H. Wilson, *A Sketch of the Religious Sects of the Hindus*, Works, vol. i., edited by Dr Rost (Lond. 1862).

TA'NTUM E'RGO, the hymn uniformly sung in the Roman Catholic Church at benediction with the Holy Sacrament. These are the first words of the penultimate strophe of the hymn *Pange Lingua*. The *Tantum Ergo* is the most popular of all the Eucharistic hymns of the Roman Catholic Church.

TANZIMAT, or TANSIMAT, the plural of the Arab word *tansim*, generally signifies 'regulations,' but in a special sense denotes the organic laws established by the Hatti-Sherif of Gulhane, in accordance with which the administration of the Turkish Empire is carried on. These organic laws, the first attempt at constitutional government in Turkey, were published by Sultan Abdul-Medjid in 1844, and treat of—1*st*, the political organisation of the empire, and the powers and jurisdiction of the chief officials and higher courts; 2*d*, administration

and finance; 3*d*, justice; 4*th*, military affairs. But the tanzimat was a dead letter, or nearly so, except in connection with the army; so that on 7th September 1854, the sultan found it necessary to publish a new ordinance, in which the complete carrying out of the tanzimat in all respects was commanded; and a commission was appointed to see that this was done.

TAORMI'NA (anc. *Tauromenium*), a town on the east coast of Sicily, situated on a narrow ledge or platform of rock, 900 feet above the sea, about 30 miles south-west of Messina. It consists mainly of a single street, more than a mile in length, is surrounded by a Saracenic wall, has numerous convents and churches, many picturesque palaces and mansions built in the middle ages, and numerous relics of antiquity, among which are very fine sepulchres, an aqueduct, tesselated pavements, remains of a 'Naumachia' and of a theatre, the last reckoned one of the most splendid ruins in Sicily, and commanding a view of almost unparalleled magnificence. T. has some trade in wine and hemp, and between 4000 and 5000 inhabitants.

Ancient *Tauromenium* was built after the destruction of Sicilian Naxos in 403 B.C., but the exact date is uncertain. It rapidly attained prosperity; but its history during the Greek and Roman period presents no striking features.

TAPA'JOS, an important river of Brazil, and an affluent of the Amazon, is formed by the confluence of the Arinos and the Juruena, both of which rise in the south of the province of Matto Grosso. After a northward course of upwards of 1100 miles in length, the T. falls into the Amazon, about 20 miles below the town of Santarem. In lat. about 7° 30′ S., it has a fall of 30 feet; but the interruptions to the navigation, which is said to reach to within a short distance of the source of the river, are few. A portage of only 18 miles separates the upper waters of the T. from those of the Paraguay.

TA'PESTRY (Fr. *tapisserie*), a kind of carpet-work for decorating walls and furniture. The art of working tapestry is extremely ancient, but we have little information about it until the time of the Saracens, who revived it, and brought it into notice. They, in all probability, only used tapestry as drapery or curtains for the courts of their houses; its use as a covering for walls seems to have been an invention of the Flemings previous to 1606, at which date it was introduced into France by Henry IV., who engaged Flemish artists to teach it. At that period, so generally was its origin attributed to the Saracens, that it was called *Sarrazinois*. The oldest piece in existence is that described under the name of the BAYEUX TAPESTRY (q. v.). At first, the Saracenic tapestries were only ornamented with flowers and geometric figures; but the Flemings aimed higher, and sought to enrich them with historic subjects of the highest order; and so important did this art become, that the most eminent masters in painting, from Raphael downwards, bestowed their greatest efforts upon cartoons to serve as copies for the tapestry-workers, of which the celebrated Raphael cartoons, formerly at Hampton Court, now in a gallery specially designed for them in the Kensington Museum, are illustrations (see CARTOON). After its first introduction into France by Henry IV. at the beginning of the 17th c., the art of making tapestry does not appear to have made much progress until the middle of that century, when a small establishment founded by the brothers Canaye on the premises formerly occupied by Jean Gobelin, a dyer of wool, was commenced, and was afterwards carried on by a Dutchman named Gluck and his assistants with such success, that it was suggested by Colbert, the minister of Louis XIV., that it should be taken under the king's patronage; in consequence of which the establishment was bought, and constituted a royal manufactory in 1667, under the management of M. Lebrun, who was the first director. A royal carpet-manufactory had been previously established in 1615; this was called La Savonnerie, from the previous use of the buildings for the manufacture of soap. The Savonnerie and the Gobelins were both carried on with great spirit by successive sovereigns, and were formed into one establishment in 1826, when the works of the Savonnerie were removed to the Gobelins, where this most interesting work is now carried to great perfection, and also at a minor establishment at Beauvais, in the department of Oise, where it is, however, worked in a different style and manner. At the Gobelins, a series of threads are arranged vertically in a frame like the warp of a loom, and the workman stands behind the frame, the pattern being placed behind him for reference. To produce the design, he has a number of wooden needles threaded with wool and silk of the colours required, and these are passed through the upright warp-threads, and brought back, so that each thread becomes covered with the necessary colour; and such is the extreme nicety with which this is done, and such the delicacy and multiplicity of the shades of colour employed, that but little difference can be detected between the tapestry picture and the painting from which it was copied. At Beauvais, the warp is placed horizontally, and the workman stands over it; this renders it necessary to cut off the ends on the upper surface, which is avoided in the other plan of working from behind. The Beauvais is, however, a style intermediate between tapestry and carpet-work, and the roughness of surface so produced has a good effect. Much fine tapestry was employed in former times in decorating the palaces and mansions of Great Britain, in many of which it is still seen in great beauty. The modern works of the Gobelins are distributed as presents by the government of France; they are not produced in great numbers, and are of great money value. The number of artists employed is about 120.

TA'PEWORM is a word popularly used in a vague sense to designate any worm of the group *Cestoidea* (see CESTOID WORMS). According to Dr Cobbold, upwards of 250 distinct forms of cestoid worms have been described, of which probably somewhat less than 200 may be regarded as really good species. These he divides into the three families of (1) *Tæniadæ*, or true tapeworms; (2) *Bothriocephalidæ*, and (3) *Tetrarhynchidæ*. For the natural history of the tapeworms generally, we must refer to the article CESTOID WORMS. We will here only remind the reader of the following points necessary for the due understanding of this article, and that every T. passes through several distinct phases during its life-history. 'In the ordinary colonial or tapeworm condition,' says Dr Cobbold, 'it has been termed the *strobila* (Van Beneden). The separate joints of which the strobila is composed are denominated *proglottides*, or zooids. The anterior segment forms the *head*, and remains barren, those of the neck and front part of the body being sexually immature during the process of strobile-formation. The mature proglottides at the caudal end are capable of realising an independent existence, and the eggs which they contain develop the six-hooked embryos, or *proscolices* (Van Beneden), in their interior. These latter become metamorphosed into *scolices* or nurses, representing the well-known cysticercal state, which, in its sterile or aborted condition, forms the common *hydatis*.'—*Entozoa*.

p. 105. During the greater part of their existence, the tapeworms are parasitic animals, the mature proglottides and eggs being free only during a comparatively short interval. They are mostly restricted in their distribution to the vertebrate animals, comparatively few of the invertebrates (excepting the cuttle-fish) appearing to harbour them in their adult condition, although the T. larvæ, nurses, or *scolices* probably abound in various invertebrate groups. In the human body, no less than ten species of T. occur, viz., eight *true tapeworms*, and two species of *Bothriocephalus;* and as four distinct species have been found in the Barbary ape, it is obvious that errors of diet, due to civilisation, are not the cause of these parasites. Amongst the animals with which we are most familiar, the species are plentiful in the common dog (and in true carnivora generally), in rats, and mice. The typical ruminants are almost constantly infested both by mature and immature forms; while the larger pachyderms, and solidungulates (the horse, ass, &c.), harbour only a few adult forms; but only larvæ appear to be known in swine. These worms appear to be as abundant in granivorous birds as in Carnivorous hawks, owls, &c. In the water-birds generally, the adult worms are very abundant, their larvæ existing in the food of such birds, in fishes, molluscs, &c. In reptiles, these worms are extremely rare, although other parasitic worms abound; while in fishes they are very abundant both in the adult and larval forms.

The *Tæniadæ*, or *true tapeworms*, may be distinguished from the other families of the order *Cestoidea* (cestoids or tapeworms in the popular sense) 'by the possession of a small distinct head, furnished with four simple oval or round suctorial discs (suckers), and commonly also with a more or less strongly pronounced rostellum (proboscis) placed at the summit in the median line. This prominence, when largely developed, becomes retractile, and when not in use, is lodged within a flask-shaped cavity, lined by a sheath, and supplied with special muscles; it is also very frequently armed with a single or double crown of horny chitinous hooks, there being occasionally as many as five or six separate circular rows of these organs. Attention to the number, relative size, and disposition of the hooks is often sufficient to determine the particular species. In nearly all cases, the reproductive orifices are situated at or near the margins of the joints which are bisexual.'—Cobbold, *op. cit.*, p. 109. The eight true tapeworms occurring in man are—(1) *Tænia solium*, Linnæus; (2) *T. mediocanellata*, Küchenmeister; (3) *T. acanthotrias*, Weinland; (4) *T. flavopuncta*, Weinland; (5) *T. nana*, Von Siebold; (6) *T. elliptica*, Batsch; (7) *T. marginata*, Batsch; (8) *T. echinococcus*, Von Siebold.

The *common tapeworm*, *Tænia solium*, derives its Linnæan title from the idea that it is always a solitary worm. Although this is commonly, it is not by any means always the case: Küchenmeister has several times found two or three together, and cases are recorded in which 30 and even 40 worms have been expelled from one patient. The full-grown T. (strobila) has been known from the earliest times, and is described by Hippocrates, Aristotle, and Pliny; but its organisation and mode of development have only been properly understood during the last few years. The segments of which it is composed vary in size, and number from 800 to 1000, the earlier immature ones being extremely narrow, and the sexually mature joints commencing at about the 450th segment. From 10 to 35 feet may be regarded as representing its ordinary length; its breadth at about the widest part being one-third of an inch. The head, which is seldom seen in the tapeworms exhibited in our museums, although the evacuation of the head with the rest of the worm is not very rare, is very small and

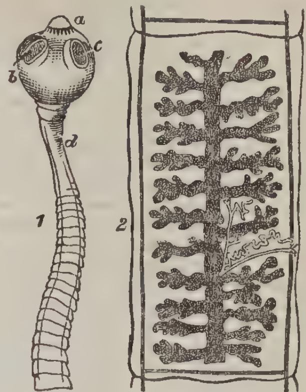


Fig. 1.

1. Head, neck, and upper joints of *Tænia solium* magnified; *a*, the circle of hooks; *b* and *c*, two of the sucking discs; *d*, the neck.—2. One of the lower or sexually mature joints of the same, shewing the water-vascular canals, and the branched uterine organ distended with ova.

globular (about the size of a pin's head), with black pigment ingrained in it. On examining it with a low magnifying power, it displays four circular sucking discs, in front of which is a conical proboscis, armed with a double crown of hooks, from twenty-two to twenty-eight in each circular row. The head is succeeded by a very narrow neck, nearly half an inch in length, which is continued into the anterior or sexually immature part of the body, in which traces of segmentation first appear in the form of fine transverse lines, which are gradually replaced by visible joints. These joints or segments represent the body, and each mature segment contains both male and female organs of generation; and in addition to these structures, the entire series of joints is traversed by a set of vascular canals constituting the so-called aquiferous system, which consists of two main channels, one passing down on either side of the worm, and both being connected by transverse vessels, which occur singly at one end of every joint. It is only in the alimentary canal of man or some other animal that a T. of any kind can attain to sexual maturity; and in all of these the eggs are fecundated before being discharged. The expulsion of the eggs may take place in any of the following ways: First, the mature segments separate from each other, and passing out of the body, either with the ordinary evacuation of the bowels or independently, become decomposed, and set free the enclosed eggs. The single joints thus discharged undergo violent contraction after being expelled, which led to their being formerly mistaken for a distinct species of worm, to which the title *Vermes cucurbitini* was applied, from their resemblance to a pumpkin seed. There is a figure in Aitken's *Medicine*, 3d ed. vol. i. p. 815, shewing the joints

Fig. 2.
The double crown of hooks more highly magnified.

of a *Tænia mediocanellata* (which will be presently described) of the natural size, in various stages of contraction; and on examining the recently discharged excrement of a constipated dog, the same phenomenon may be very frequently observed. Secondly, the eggs may be discharged through the genital pore by pressure from any cause. It is only thus that we can account for the occasional (but very rare) co-existence of a *Cysticercus cellulosæ* (the embryo of the worm) and an adult T. in the intestinal canal of the human subject—an association which constitutes one of the most serious dangers which the matured worm can inflict upon its host, and one of the strongest indications for its removal. Thirdly and lastly, the mature joints sometimes appear to undergo disintegration within the intestine, and to liberate the eggs; but the conditions under which this disintegration occurs are unknown. In reference to the ultimate fate of the embryos *in ovo*, that are liberated in the intestinal canal, Dr Cobbold has informed the author of this article in a private communication, that, in his opinion, they do not migrate in the living host, except when by regurgitation they occasionally get into the stomach, when, after their shells have been dissolved by the gastric juice, the young organisms commence their wanderings. The mature segments are usually expelled from the human bowel at the rate of six or eight a day. Their vitality is prolonged by moisture, which favours the distribution of the liberated eggs over grass and other vegetables, or in water, which may be used as food or drink by animals. For a full description of the eggs, we must refer to Dr Cobbold's work. It is sufficient here to remark, that, in their mature condition, they 'present a globular figure, and are easily recognised by their remarkably thick shell, which surrounds the six-hooked embryo. They present an average diameter of $\frac{1}{851}$th of an inch, the shell itself measuring about $\frac{1}{4000}$th of an inch in thickness. After a while, by accident, as it were, a pig coming in the way of these embryos, or of the proglottides, is liable to swallow them along with matters taken in as food. The embryos, immediately on their being transferred to the digestive canal of the pig, escape from the egg-shells, and bore their way through the living

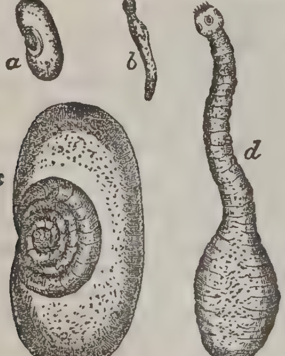


Fig. 3.

a, a fully developed *Cysticercus cellulosæ* or *Measle*, taken from fresh pork (natural size); *b*, Cysticercus from salted pork; *c*, the same as *a*, magnified about 3 diameters; *d*, the same as *c*, with the head and body withdrawn from the caudal vesicle.

tissues of the animal, and having lodged themselves in the fatty parts of the flesh, they there rest to await their further transformations or destiny. The animal thus infected becomes measled, its flesh constituting the so-called measly pork. In this situation, the embryos drop their hooks, and become transformed into the *Cysticercus cellulosæ*. A portion of this measled meat being eaten by ourselves, either in a raw or imperfectly cooked condition, transfers the cysticercus to our own alimentary canal, in which locality the cysticercus attaches itself to the wall of the human intestine, and having secured a good anchorage, begins to grow at the lower or caudal extremity, producing numerous joints or buds form the strobila or tapeworm colony.'—Cobbol *Entozoa*, p. 221. In its fully mature stage, the *meas* presents the appearance of an elliptical hydatid, varying in size from that of a pea to that of a small kidney-bean, the average diameter being one-third of an inch. On dissecting or breaking up a measle, it will be seen that the great vesicular portion constitutes the bladder-like caudal extremity of the cysticercus, while the head, neck, and body can be drawn out so as to exhibit a vermiform character.

In the article GENERATIONS, ALTERNATION OF, it was stated that the group of phenomena included in that term would be further illustrated in the history of the tapeworm. From what has been already shewn, it appears that 'we have a simple alternation of generation in which the immediate product of the proglottis (or sexually matured zooid individual) is a six-hooked brood; by metamorphosis, the latter becomes transformed into the cysticercus, having a head with four suckers, and a double crown of hooks; and by gemmation, the latter gives rise to a whole colony (strobila) of individuals, the greater part of which are destined to become sexually mature—zooid individuals or proglottides. It will be observed, therefore, that the product of a single ovum is, in the first instance, a single non-sexual embryo; in the second phase, it becomes a non-sexual cysticercus (these two phases together constituting the protozooid); in the third change it gives off, by budding, numerous gemmules, most of them destined to be sexually mature individuals (or deuterozooids), in this way resembling their original parents. The relation and nature of these developmental changes may be further simplified by placing the various life phases in a tabulated form as follows:

(*a.*) Egg in all stages. } Protozooid
(*b.*) Six-hooked embryo = proscolex. }
(*c.*) Resting larvæ, or *Cysticercus* (*telæ*) *cellulosæ* (scolex). }
(*d.*) Immature tapeworm.
(*e.*) Strobila, or sexually mature *Tænia solium*.
(*f.*) Proglottis (cucurbitinus) = free segment = deuterozooid.

—Cobbold, *Entozoa*, pp. 221, 222.

How long a T. can naturally exist in an intestinal canal, is not known; but there is doubtless a period at which the parasite spontaneously separates from the intestinal mucous membrane of its host—a period probably coinciding with the shedding and non-renewal of the circlet of hooks. When this separation occurs, the whole length of the worm is expelled, in the same manner as if the parasite had been first killed by the administration of a vermifuge medicine. From this history of the structure and life-history of this organism, which applies with slight difference in minor points to all other tapeworms, we proceed to describe the injurious effects which the worm in its adult and larval stages produces on man, and the precautions which should be taken to prevent its entrance into the system; while the discussion of the means of expelling it when it has once found a lodgment in the intestinal canal, will be postponed to the article on VERMIFUGES.

The common T. may cause disease, and even death, by its aggressions, either in the adult or in

the larval stage of its existence. A mature T. in the intestinal canal may give rise to a series of anomalous symptoms, including 'vertigo, noises in the ears, impairment of sight, itching of the nose and anus, salivation, dyspepsia, and loss of appetite, colic, pains over the epigastrium and in different parts of the abdomen, palpitation, syncope, the sensation of weight in the abdomen, pains and lassitude in the limbs, and emaciation.'—Davaine, *Traité des Entozoaires*, &c., p. 103. Many cases are on record in which hysterical fits, chorea, epilepsy, convulsions of various kinds, and even mania, have been induced by the irritation excited by this parasite, and have ceased at once on its removal. But distressing as these symptomatic phenomena may be, their injurious effects are trifling as compared with the troubles which follow the deposition and growth of the larval form within the body, especially when the cysticerci find a home in the more important vital organs. There are at least a hundred cases on record in which the cysticercus has caused death by its development within the human brain. In the present state of our knowledge, it is impossible to diagnose these cases; and even if a correct diagnosis were possible, nothing could be done in the way of treatment. Epilepsy, with or without mania or imbecility, is commonly, but not invariably present in these cases. 'Cysticerci,' says Dr Cobbold, 'may develop themselves in almost any situation in the human body, but they occur most frequently in the subcutaneous, areolar, and intermuscular connective tissue; next, most commonly in the brain and eye, and lastly, in the substance of the heart and other viscera of the trunk.'—*Entozoa*, p. 226. The *adult form of the worm* enters the system as the cysticercus of measly pork, and to eat raw or underdone measly pork is an almost certain means of introducing this parasite into the body. It is satisfactory to know that the temperature of boiling water is quite sufficient to destroy the vitality of the measles; and that in ordinary salted pork, and in hams, they are destroyed by the action of the salt in the one case, and of the combined salt and smoke in the other. Sausages, into which it is to be feared measly pork too often finds its way, are rendered safe if they are cooked till no pink, raw-like, fleshy look can be seen in their centre. Butchers are especially liable to T., in consequence of their touching and cutting measly pork, and then accidentally transferring the cysticercus by the hand, or even by the knife, to the mouth; and by indiscriminately using the same knife for various meats, both butchers and cooks may readily disseminate the infection over various articles of food. The *larval worm* may gain access into the human body by our swallowing the mature eggs of the tapeworm. Those who, as students of this department of natural history, handle fresh tapeworms, are perhaps especially liable to this misfortune; but, says Dr Cobbold, 'our neighbours, who devour choice salads, also run a certain amount of risk, not only as regards this entozoon, but as respects several others. The vegetables may be manured with night-soil containing myriads of tapeworm eggs, or they may be watered with fluid filth into which these eggs have been cast. In such cases, one or more tapeworm ova may be transferred to our digestive organs, unless the vegetables are carefully cleansed before they appear on the table. In the same way, one perceives how fallen fruits, all sorts of edible plants, as well as pond, canal, or even river water, procured from the neighbourhood of human habitations, are liable to harbour the embryos capable of gaining an entrance to our bodies. It thus becomes evident also how one individual suffering from tapeworm may infect a whole neighbourhood, rendering the swine measly, these animals in their turn spreading the disease far and wide.' Such a person may also prove dangerous—even fatal to his neighbours directly (without the intervention of a pig), by ejecting mature proglottides, from which thousands of eggs may escape, some of which may readily come in contact with human food or drink, make their way into the stomach, and from thence get into the circulation, and finally to the brain, where they cause convulsions and death. The most remarkable case on record of what may be termed a *measly* man, is one described, in 1864, by Delore, in the *Gazette Méd. de Paris*, and quoted by Dr Cobbold. He died at the age of 77, from pulmonary catarrh, old age, and fractured neck of the thigh-bone; and on examining his body after death, no less than 2000 cysticerci were found, of which 111 occurred in the nervous centres.

The T. that ranks next in importance to the *Tænia solium* is the *Tænia mediocanellata*, which was first established as a distinct species by Küchenmeister only a few years ago. It exceeds the *T. solium* both as regards length, breadth, and the thickness of the individual segments; the head is also somewhat larger, abruptly truncated at the crown, destitute of a proboscis and a hook-apparatus—hence this species has been described as the *hookless tapeworm*—but furnished with very large sucking-discs, surrounded by much dark pigment, which gives the head a blackish appearance. The specific name of *mediocanellata* has reference to an interesting and almost specific character in connection with the water-vascular system, into which we have not space to enter.

Fig. 4.

Head of *Tænia mediocanellata*, magnified about 35 diameters.

(From Cobbold.)

Leuckart has proved by experiment that the measles or cysticerci which produced this worm are to be found in the muscles and internal organs of cattle. He administered proglottides of *T. mediocanellata* to three calves, a sheep, and a pig. In the two last-named animals, they produced no effect, as was shewn by their post-mortem examination; while in the calves they produced a kind of leprosy, which has since been characterised as 'acute cestoid tuberculosis,' and which proved fatal if too large a dose of eggs was administered. On examining one of these animals after its restoration to health—48 days after the eggs were swallowed—he found numerous cysticercus-vesicles, larger and more opalescent than those of the pig, lodged within the muscles; and as the heads of the contained cysticerci exhibited the distinctive peculiarities presented by the head of the adult worm, 'we are supplied with the most unequivocal evidence that man becomes infested with this second form of tapeworm by eating imperfectly cooked veal and beef.' Hitherto, the two above-described species have commonly been included under *T. solium*, from want of due examination, especially of the head. Dr Cobbold believes that their respective frequency will ultimately be found pretty well on a par, though probably the *T. solium* will maintain a slight ascendency, in consequence of the relative cheapness of pork. 'Admitting occasional exceptions,' he observes, 'the hooked worm infests the poor, and the hookless worm the rich. This circumstance

accords with the fact, that the lower classes subsist chiefly upon pork, whilst the wealthier prefer mutton, veal, and roast-beef.'—*Entozoa*, p. 243. It gives rise to the same symptoms as the *T. solium*.

The next five tapeworms infesting man may be passed over without notice, as being of very rare occurrence. *Tænia acanthotrias* is only known from a single case, in which, in the larval stage, it was found in the muscles of a woman. The last species we shall describe, the *T. echinococcus*, is, in its larval condition, probably more fatally injurious to the human race than all the other species of entozoa put together. In its mature (strobila) condition, in which it is found only in the dog and wolf, it seldom exceeds the fourth of an inch in length, and develops only four segments, including that of the head. The final segment, when sexually mature, equals in length the three anterior ones, and contains as many as 5000 eggs. The proscolex or embryo forms large proliferous vesicles, in which the scolices or larvæ (known also as acephalocysts, echinococci, echinococcus heads or vesicles, pill-box hydatids, &c.) are developed by gemmation internally. The eggs develop in their interior a six-hooked embryo, and these embryos are introduced into our bodies with food or water into which the eggs have been carried. 'With an especial liking for the liver,' says Dr Cobbold, 'they bore their way into this organ, or are carried along the circulating current to other organs. In these situations, they sooner or later become transformed into simple vesicular, bladder-like bodies, commonly called acephalocysts or hydatids.' Instead, however, of displaying the head, neck, and body of a cysticercus, the vesicle retains a globular figure. Its growth is slow, and many months elapse before echinococci are developed within our bodies, after we have swallowed the proper T. eggs and their contained embryos. There have been great differences of opinion amongst physiologists as to the mode of development of these echinococci; but the following is probably the current view. The inner surface of the vesicle presents after a time slight papillæ or prominences, which, as they enlarge and become oval, are eventually scoleciform, and contain a cavity filled with a limpid fluid. This scolex-like development produces in its interior a brood of scolices or echinococcus heads, or, in other words, becomes gradually transformed into the so-called 'brood-capsules' of helminthologists. It is almost impossible to explain the nature of these brood-capsules, with young echinococci in their interior, without the aid of such diagrams and illustrations as are given by Cobbold in his chapter on *T. echinococcus*. In the fully developed state, the echinococci vary from $\frac{1}{80}$th to $\frac{1}{100}$th of an inch in diameter. The rostellum supports a double curve of hooks, those in the smaller row varying in size from $\frac{1}{1040}$th to $\frac{1}{1780}$th of an inch, whilst those of the larger series are from $\frac{1}{830}$th to $\frac{1}{1780}$th of an inch. Below the hooks are four suckers, and the general appearance of the body is finely granulated, from its containing calcareous particles. These hooklets are so characteristic and important in diagnosis, that we give a highly magnified representation of them. It often happens that the discovery under the microscope of a few of these little hooks at once decides the nature of an otherwise mysterious tumour. Of 373 cases of the parasite occurring in man, collected by Davaine (who devotes more than one-third of his *Traité des Entozoaires* to this subject), 165 affected the liver, 40 the lungs, 30 the kidneys, 20 the brain, and 17 the bones, while the remainder were spread over other parts; and of 136 cases collected by Cobbold, 51 affected the liver. No less than 35 of these 51 cases recovered. 'Four of them were complete natural cases; two others being also temporarily cured in the same way. All the rest were cured by surgical operations.' It is impossible to state with accuracy the degree or prevalence of hydatids in Great Britain, or the extent to which it proves fatal. In Iceland, this disease is endemic to such a degree that about one-sixth of the population are affected with it. It produces a long illness, terminating with a painful death, and no means of cure have yet been discovered. Its prevalence in that island may be rationally accounted for. Firstly, every peasant has, on an average, six dogs, all of which are probably infested by the mature T.; and secondly, there being only six legally authorised medical men, the great majority of the population (over 10,000 persons, scattered over 1500 sq. m.) are in the hands of quacks, whose principal treatment consists in the administration of *fresh dog-excrement!*

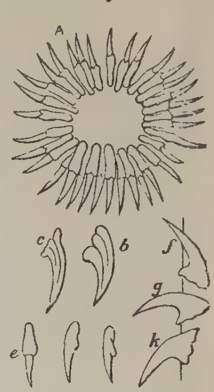


Fig. 5.

A, magnified view of the circle of hooklets, seen upon its under surface, thirty-four in number; *b*, *c*, lateral views of the separate hooklets; *e*, hooklets seen on the inferior or concave border; *f*, *g*, *h* illustrates the movements and position of the hooklets, the vertical line running through the fixed point of each of the three hooks.

Our authority for this astounding specimen of homœopathic treatment is Leuckart, whose admirable popular essay, *On the Newest Discoveries regarding Human Intestinal Worms, and their Importance in Relation to Hygiene*, in the *Conversations Jahrbuch*, 1863, is deserving of the most careful study. For an excellent abstract of the remarkable series of experiments—extending from 1851 to the present day—by which the relationship between the so-called cystic worms and the cestoid worms was established, we may refer the reader to Aitken's *Science and Practice of Medicine*, vol. i.; while for the subject of T. generally, the highest authorities are the works of Küchenmeister and Siebold, translated by the Sydenham Society; Davaine's *Traité des Entozoaires;* Weinland's *Essay on the Tapeworms of Man;* Leuckart's *Das Menschlichen Parasiten* (not yet completed); and Cobbold's *Entozoa*, 1864, a work equally remarkable for the vast amount of original research which it contains, and for the beauty and correctness of the illustrations.

TAPEWORMS, although rare amongst horses and cattle, are common in dogs and sheep, causing irritability of the bowels, and an unthrifty appearance. For dogs, no remedy answers so well as powdered areca nut, of which 30 grains suffice for a dog weighing about 20 lbs. It is best given after ten or twelve hours' fasting, in a little soup or milk, and should be followed in a few hours by a dose of castor oil. Neither areca nut nor any of the approved remedies used in men, prove effectual in sheep; and one of the best prescriptions for them consists of 40 drops of oil of turpentine, a drachm of powdered green vitriol, and an ounce of common salt, given mixed in a little milk or gruel, or, where their bowels are confined, in linseed oil. A daily allowance of linseed cake and sound dry food should likewise be given with the grass or roots, and pieces of rock-salt left within the animal's reach.

TAPIO'CA. See MANIOC and CASSAVA.

TA'PIR (*Tapirus*), a genus of the *Perissodactyle* division of the *Ungulata;* having a bulky form, with moderately long legs; the fore-feet four-toed, the hind-feet three-toed; the skin thick, the hair short; the tail very small; the neck thick; the ears short; the eyes small; the muzzle elongated; the nose prolonged into a short, flexible proboscis, which, however, does not terminate in an organ of touch and prehension, like that of the elephant; six incisors, two canine teeth, and fourteen molars in each jaw, the molars separated from the canine teeth by a wide interval. The best known species is the AMERICAN T. (*T. Americanus*), which is about the size of a small ass, and is common in almost all parts of South America, its range extending as far south as the Strait of Magellan, although it suddenly ceases to be found at the Isthmus of Darien. Its colour is a uniform deep brown, but the young are beautifully marked with yellowish fawn-coloured stripes and spots. The skin of the neck forms a thick rounded crest on the nape, with a short mane

Malayan Tapir (*Tapirus Malayanus*), and Young.

of stiff hair. The T. inhabits deep recesses of the forest, and delights in plunging and swimming in water. It feeds chiefly on young shoots of trees, fruits, and other vegetable substances; but is ready to swallow almost anything that comes in its way. Pieces of wood, clay, and pebbles are often found in its stomach. It sometimes commits great ravages in cultivated grounds; a large herd of tapirs sallying forth from the forest by night, trampling and devouring all that they find in the fields. The T. is a very powerful animal, and, protected by its thick hide, forces its way through the forest where almost no other quadruped can. When assailed by the jaguar, it seeks to get rid of him by rushing through thick underwood, and if it can reach water, is often successful by plunging in and diving. It is inoffensive, never attacking man; but when hard pressed by dogs, makes a violent resistance, and inflicts severe bites. It is very easily tamed, and becomes extremely familiar; but its large size makes it a troublesome pet. Its hide is useful, and its flesh is eaten, although rather dry.—The MALAYAN T. (*T. Malayanus* or *Indicus*) is found in Malacca, Sumatra, &c. It is larger than the American T., and its proboscis is rather longer in proportion. The neck has no mane. The colour is glossy black, except the back, rump, and sides of the belly, which are white. The colours do not pass gradually one into another, but the line of separation is marked, giving the animal a very peculiar appearance. The habits of this species are very similar to those of the American T., and it is equally capable of domestication. The young are striped and spotted as in that species.—A third species is found in the mountainous parts of South America, and two in Central America and Mexico.

The remains of tapirs have been found in Miocene and subsequent strata. In all, about twelve species have been determined. Tapir-like animals are common in Eocene beds. Ten species of *Palæotherium* (q. v.) have been described. *Lophiodon*, of which fifteen species have been observed, differs from *Palæotherium* in the structure of the teeth of the lower jaw —and from other peculiarities in the same organs, *Coryphodon* (containing three species) has been separated from both genera.

The T. is a remarkable exception to the generalisation deduced from the comparison of the later Tertiary mammals with those living in the same districts at the present day, viz., that there is a close correspondence between the fauna of the two periods. The Pliocene and Post-pliocene bears, hyenas, tigers, elephants, &c., of Europe and Asia are represented by living species of the same of nearly allied genera. The recent sloths, armadilloes, and prehensile-tailed monkeys of South America were preceded by closely related forms in the later Tertiary period; as were also the marsupials of Australia. Several species of T. have been found in Europe, but they have left no representatives nearer than Eastern Asia and South America.

TAPPING is an operation which is most commonly performed on the abdomen, but occasionally on the chest and head. Tapping of the abdomen gives great relief when the abdomen becomes inconveniently distended with fluid contained in the peritoneal sac, or, in the case of the female, in an ovarian cyst. A small incision is then made about two inches below the navel, through which the cutting surfaces of the trochar—the instrument used in this operation—are passed. By arrangements into which we need not enter, the fluid escapes through this instrument. The wound made by the trochar in the abdomen will, in ordinary cases, heal in a few days.

Tapping of the chest is an operation which is occasionally required for the relief of empyema and other effusions in the cavity of the pleura. Tapping of the head has been occasionally found successful in hydrocephalus. Tapping of the pericardium has been practised in cases of pericardial dropsy, but it is an operation not to be recommended under any circumstances.

TA'PTI, a river of the British presidency of Bombay, India, rises in the Saugur and Nerbuddah territories, in lat. about 21° 46′ N., flows west through Scindhia's dominions and the districts of Candeish and Surat to its mouth in the Gulf of Cambay, 17 miles below the town of Surat. It is 441 miles in length; but can hardly be said to be navigable, for even small vessels of from 40 to 50 tons burden cannot ascend higher than Surat.

TAR is a well-known substance, for which it is difficult to frame a definition, since it varies in composition, colour, and consistence, and is derived from all three kingdoms of nature. In various parts of the world, it occurs as a natural mineral product, and is known under the various names of bitumen, asphalt, petroleum, natural tar. See NAPHTHA. As an animal product, a species of tar is obtained from the destructive distillation of bones employed in preparing bone-black. The distillate, which possesses a most offensive odour, separates into a heavier layer of black animal tar—commonly known as *bone-oil*, or *Dippel's Animal Oil*—and a lighter layer of watery solution of sesquicarbonate of ammonia, commonly known as *bone-liquor*, and much employed in the preparation of various salts

of ammonia. This animal tar is chiefly used for the lubrication of machinery. The vegetable kingdom is, however, the most important source of tar. On submitting wood to destructive distillation in closed vessels, we obtain a large number of products, which are described in the article WOOD, DISTILLATION OF; some are gaseous and some liquid, and of the latter one portion is soluble and the other insoluble in water. This insoluble portion constitutes wood-tar, and is composed of a mixture of various liquids holding solid matters in solution or in suspension. Amongst its most important constituents, Professor Miller mentions several forms of hydrocarbon, such as toluol, $C_{14}H_8$; xylol, $C_{16}H_{10}$; cymol, $C_{20}H_{14}$; and eupion, besides a number of oxidised compounds, including creasote, $C_{24}H_{16}O_4$, picamar, and kapnomar, $C_{20}H_{11}O_2$; whilst among the solid portions are resinous matters resembling colophony, and a waxy substance named paraffin, and many other substances, such as naphthalin, cedriret, pittacal, pyrene, $C_{30}H_{12}$; chrysene, $C_{12}H_4$; and pyroxanthin. (When the formula is not given, the exact composition of the substance is not determined with certainty.) The *Stockholm tar*, which is so widely used in ship-building, and the *American tar*, which is almost equally celebrated, are chiefly prepared from the resinous wood of the pine, and especially of the root of the tree. The specific gravity of ordinary tar is about 1·040. Peat yields a tar very similar to wood-tar. Coal yields, on distillation in closed vessels, even a larger number of products of distillation than are yielded by wood. In addition to numerous gaseous products, the liquid portions contain water and various forms of hydrocarbon, which collectively form the liquid known as *coal-naphtha;* besides which there is a large quantity of a dark viscous matter known as *coal-tar.* The mixture of naphtha and tar is described in this work under the title of GAS-TAR. The distillation of coal-tar is conducted on an extensive scale as a separate branch of trade. For a description of the operation, we must refer to Professor Miller's *Organic Chemistry* (2d ed., pp. 650, 651), from which work we extract the following remarks on the compounds present in this substance: 'Of the substances contained in coal-tar, some are basic, and some acid, but the principal portion consists of neutral or indifferent bodies. The bases include ammonia, aniline, picoline, quinoline, and pyridine. Among the acids, the acetic is present in small amount; but the most important is phenic acid, the carbolic acid of Runge. This chemist also mentions two other acids named *rosolic* and *brunolic* acids. The neutral substances contain several hydrocarbons, including benzol, toluol, cumol, and cymol, which are among the liquid constituents; while naphthalin, anthracene, chrysene, and pyrene are amongst those which are solid at ordinary temperatures.' When either wood-tar or coal-tar is submitted to distillation, the solid brown or black residue left in the retort constitutes *pitch.*

Wood-tar, under the title of *Pix liquida*, is included in the Pharmacopœia, in which its characters are given as follow: 'Thick, viscid, brownish black, of a well-known peculiar aromatic odour. Water agitated with it acquires a pale-brown colour, sharp empyreumatic taste, and acid reaction.' Tar was more used in medicine in former times than at present. Bishop Berkeley's commendatory essay on the use of tar-water in diseases of the chest and kidneys, is well known to all literary students (see Chambers's *Book of Days*, vol. i. p. 108). Since his time the inhalation of tar-vapour has been highly recommended in cases of phthisis; and tar-capsules are still occasionally prescribed in cases of relaxed mucous membrane. In the present day, tar is, however, seldom used except as a local stimulant in chronic cutaneous diseases.

In modern commerce, there are two kinds of wood-tar known—that made in the north of Europe from the wood of *Pinus sylvestris*, and the North American, which is made from *Pinus rigida*, *P. tæda*, *P. Australis*, &c. The distillation is usually performed in a very rude manner: a funnel-shaped hole is dug in a bank, about 6 or 8 feet in diameter at the upper part, and not more than 18 inches at the lower. At the bottom of the hole is placed an iron pan, having a long spout or pipe, which is made to pass through the bank; the hole is then filled up with billets cut from the roots and branches of the pine-trees, which, after being kindled at the top, are covered over incompletely with turf. The wood is thus charred from above downwards; and the tar, mixed with various other products, flows off at the bottom through the spout into a receiver. A somewhat similar product is obtained in the distillation of coal for gas, and in the distillation of bones in forming animal charcoal. Formerly, the chief value of these materials was as a preservative coating for exposed wood-work, ships' sails, ropes, &c., in consequence of their very highly antiseptic properties. A better knowledge of their chemical history has, however, much increased their value. The imports of wood-tar into Great Britain exceed five millions of gallons, besides which, nearly two millions more are made from coal and bones in gas and charcoal works. The total value of this product amounts to upwards of £400,000 per annum.

TA'RA, or **TARO** (*Colocasia macrorhiza*), a plant of the natural order *Araceæ*, of the same genus with the Cocco (q. v.), or Eddoes, and cultivated for its roots, which are a principal article of food in the South Sea Islands. The roots are 12 to 16 inches long, and as much in girth. They are washed to take away their acridity, which is such as to cause excoriation of the mouth and palate. They are cooked in the same way as bread-fruit, the rind being first scraped off. A pleasant flour is made of tara. Many varieties are cultivated. The plant has no stalk; broad, heart-shaped leaves spring from the root; and the flower is produced in a spathe. The leaves are used as spinach.

TARA FERN (*Pteris esculenta*), a species of Brake (q. v.), the root (rhizome) of which was one of the principal articles of food of the New Zealanders, before the settlement of New Zealand by British colonists. This fern comes to perfection only in good soils, and there the plant is 10 feet high. Plants three years old furnish the best roots, which are about an inch in circumference. The root, being dug up, is cut in pieces about 9 inches long, and placed in stacks, carefully protected from rain, but through which a current of air blows. Fresh fern-root is not good; it is the better of being a year above ground. Before being cooked, it is steeped in water, and dried in the sun. It is then roasted. A large quantity of a very pleasant flour is obtained from it by beating on a stone, the fibre alone being thus left.

TARA'NNON SHALE, the upper member of the Llandovery formation of the Silurian Rocks (q. v.). It consists of shales, or pale, sometimes purple, slates with very few fossils.

TA'RANTISM may be defined a leaping or dancing mania, originating in, or supposed to originate in, an animal poison. The name is supposed to be derived from the ground-spider, *Tarantula* (q. v.), which conveyed the poison into the human body by its bite. The gesticulations, contortions, and cries somewhat resembled those observed in St

Vitus's Dance, and other epidemic nervous diseases of the middle ages, with which tarantism was contemporaneous; but the affection differed from these in its origin, in the cachexia present, in the elegance of the movements of the victims, in their partiality for red colours, bright and luminous surfaces, their passion for music, and in their restoration depending upon the use of instrumental or vocal music as a remedy. Although the sufferers were subjected to extraordinary treatment, such as being buried up to the neck in earth, the success of music was so universal and invariable, that a class of tunes and songs was composed, called *Tarentella*, to be employed in the cure of the tarantati. These have lingered long after the extinction of the malady, and may still be heard in the wilder districts of Italy. While it is highly probable that the physical symptoms were due to the bite of spiders, the mental disturbances and muscular *agitation* should be traced to the secondary effects of these upon the nervous system and imagination. It appeared in various parts of Italy, but was most prevalent in Apulia, where the insects abound. No age or class appears to have been exempt, for we read of a philosophic bishop who allowed himself to be bitten by a tarantula, dancing, &c. as fast and furiously as the peasantry.—Hecker, *Epidemics of Middle Ages*, p. 110; Madden, *Phantasmata, or Illusions and Fanaticisms*, vol. i. p. 415; Milligen, *Curiosities of Medical Experience*, p. 88.

TARA'NTO (anc. *Tarentum*), a town of Southern Italy, province of Terra d'Otranto, is situated on a rocky islet, formerly an isthmus, between the Mare Piccolo (Little Sea), an extensive harbour on the east or landward side of the town, and the Mare Grande (Great Sea), or Gulf of Taranto, on the west. The natural channel between the two 'seas' has been spanned by a long bridge of seven arches, rendering the Mare Piccolo quite useless as a harbour, and forcing ships to anchor in the outer roads, which are much exposed to south and south-west winds. The principal buildings of T. are a cathedral dedicated to St Cataldo, a native of Raphoe in Ireland, who was first Bishop of T.; a fine episcopal palace; a castle and fortifications erected by Charles V., and commanding both seas; and two hospitals. The streets are as narrow and dark as those of an oriental city. T. has manufactures of velvets, linens, and cottons, but little commerce. The Mare Piccolo, however, is still famous (as of yore) for its immense abundance of shell-fish, and a considerable portion of the population (which amounts to about 30,000) derives its subsistence from the oyster and mussel fisheries.

Ancient Tarentum, however, was a far more famous and splendid city than its modern representative. Founded by a body of Spartan emigrants about 708 B. C., it grew and prospered for centuries in happy obscurity. Its territory was not perhaps very fertile, but its pasturage was of the finest, and its olive groves were unsurpassed. Yet it was not these things that ultimately made it the sovereign city of Magna Græcia; this rank it attained through the supreme excellence of its harbour (the Mare Piccolo), ample and secure beyond all the other harbours of Lower Italy. Gradually it became the chief emporium of the Græco-Italian trade, and long after all the rest of the colonial cities in Magna Græcia had fallen into decay, Tarentum was 'blooming alone' in undiminished prosperity. We may pass over its earlier history, noticing only the fact, that in the 4th c. B. C., it had for its *strategos*, or general (seven times), the philosopher and geometer Archytas, under whom it became the headquarters of the Pythagorean sect, and was honoured with a visit from Plato, who was the guest of Archytas during his residence there. But while in the very acmé of its greatness, it provoked a quarrel with Rome (q. v.), 281 B. C., in which, though aided by the gallantry of Pyrrhus (q. v.), king of Epirus, it was utterly crushed, after a struggle of less than ten years; and though its natural advantages hindered it from sinking into such absolute insignificance as other cities of Magna Græcia, it was never after a place of great importance. Under the Empire, it was quite overshadowed by Brundusium on the Adriatic, but rose again during the Gothic wars, and passed into the hands of the Saracens and Greeks, from the latter of whom it was wrested by Robert Guiscard, the Norman, in 1063. Since then, it has shared the fortunes of the kingdom of Naples. Few relics of the classic Tarentum are extant, the chief being bits of an amphitheatre, a circus, and traces of some of the temples.

TARA'NTULA (*Lycosa tarantula*), a species of spider, of a genus to which the name Wolf-spider is often given, a native of the south of Europe. It derives its name from the city of Taranto, in Italy, where it is very plentiful. It is one of the largest of

Tarantula Spider (*Lycosa tarantula*).

European spiders, of a somewhat elongated shape, with rather long legs. It is one of those spiders which seek their prey by hunting. Its bite is much dreaded, and has been supposed to cause the disease called *Tarantism* (q. v.).—Several species of spider nearly allied to the T. are found in different parts of the south of Europe. One of them (*Lycosa Narbonnensis*) frequents dry uncultivated grounds in the south of France, and makes a little pit in the ground, near the entrance of which it sits watching for prey. The prey is carried into the pit to be devoured. The female shews great affection for her young.

TARARE, a thriving and important manufacturing town of France, in the dep. of Rhone, stands at the foot of Mount Tarare, one of the highest summits of the Beaujolais range, 21 miles north-west of Lyon. Formerly unimportant, it is now a rich and flourishing town, the inhabitants of which are engaged in the manufacture of muslins, cloth, silk, and merino fabrics, and in embroidering and bleaching. The muslins of T. are famous for their fineness. See TARLATAN. Pop. 14,569.

TARASCON, a town of France, in the dep. of Bouches-du-Rhone, 13 miles south-west of Avignon by railway. The church of St Martha dates from the year 1187, and is so called after Martha, the sister of Lazarus, and the patron saint of the town. Woollen and silk fabrics, and brandy and vinegar, are manufactured. Pop. 13,489.

TARA'XACUM, or Dandelion (q. v.) Root, is employed to a considerable extent in medicine. The roots should be gathered in August and September, when the juice is most abundant. There is no very satisfactory analysis of this juice, but it is said to contain mannite, resin, sugar, gum,

caoutchouc, and a crystallisable matter termed *taraxicine*, on which its active properties probably depend. This medicine may be prescribed with advantage in the form of extract, decoction, or juice in chronic diseases of the liver, and in certain forms of dyspepsia and skin-disease which are accompanied by derangement of the biliary organs. In very large doses, it has a diuretic and slightly aperient action.

TARAZO'NA, a town of Spain, in the province of Zaragoza, 52 miles west-north-west of the city of that name, on the Queyles, a tributary of the Ebro. It stands on a wind-blown plain, exposed to bleak winds from the Sierra de Moncayo on the south and from the Pyrenees on the north. It is the see of a bishop; and contains a cathedral with a slender brick spire and rich interior, a bishop's palace, and a Moorish *Alcazar*. Pop. upwards of 6000, mainly engaged in agriculture.

T. is the ancient *Turiaso;* and here a few Roman troops routed a Celtiberian army. It became a municipium under the Romans; and under the Goths, by whom it was fostered, it became famous for its steel.

TARBAGATAI', a frontier town of Chinese Turkestan, 170 miles east of the eastern extremity of Lake Balkash, in lat. 46° 44′ N., long. 82° 28′ E. It stands at the foot of the mountains of the same name, in a plain watered by the Imil, and with extensive meadows and pasture-grounds in the vicinity. The inhabitants consist of 3000 exiled Chinese, 1000 of a Chinese garrison, and a number of Mongolian merchants. The trade with Russia is important.

TARBES, a town in the south of France, capital of the dep. of Hautes-Pyrénées, stands on the left bank of the Adour, 23 miles east-south-east of Pau. It is a station on the *Chemin de fer du Midi*, and the centre of communication with all parts of the Pyrenees, the lofty line of which bounds the prospect on the south. The modern cathedral is the principal and indeed the only notable building. There is here a *haras*, or government stud, for the improvement of the breed of horses. T. is the seat of an active general trade. Pop. 14,768.

T. dates from the time of the Romans, and its bishopric was founded in the year 420.

TARDIGRADA. See SLOTH.

TARE (*Ervum*), a genus of plants of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, distinguished from *Vicia* (see VETCH), to which it is nearly allied, by a capitate stigma, downy all over. It contains only a few species of weak climbing plants, natives of the temperate parts of the Eastern Hemisphere. One of these is the LENTIL (q. v.).—Two (*E. hirsutum* and *E. tetraspermum*), generally known by the name of TARE, are common in cornfields and hedges in Britain. They have very small flowers and pods; the leaves are pinnate, and the leaflets small. They afford nourishing food for cattle, but the quantity is so small that they are not worthy of cultivation, and are chiefly known as a nuisance in cornfields. A species of T. (*E. sativum*), with an upright branching habit, is cultivated in some parts of Europe for its herbage, which is used for feeding cattle. The bulk of herbage is small, but its nutritious character is thought to compensate for this. The leaves have from 8 to 14 pair of leaflets. The plant thrives well in poor sandy soils.—It is not supposed that the *Tare* of the New Testament has any affinity to these plants: it is doubtful what it is, but it appears not improbable that it is the DARNEL (q. v.).

TARE AND TRET, certain deductions usually made from the gross weight of goods. *Tare* is the weight of the box, cask, bag, or wrapping in which the goods are contained; and the amount is obtained either by weighing the empty package itself, by taking an average of a few similar packages of equal size, or by mutually agreeing upon a certain proportion of the gross weight. The remainder, after deducting the tare, is the *net weight*. Another deduction, at the rate of 4 lbs. for every 104 lbs., or $\frac{1}{26}$th of the net weight, is then made, as an allowance for waste through dust, &c., and is called *tret*. Some other allowances of minute magnitude as draft, cloff, &c., are occasionally made after tret, but they are falling into disuse.

TA'RGET (root uncertain, but the word, in some form, found in all European languages), in its modern sense, is the mark for aiming at in practising with the cannon, rifle, or bow and arrow. In its more ancient meaning, a target or targe was a shield, circular in form, cut out of ox-hide, mounted on light but strong wood, and strengthened by bosses, spikes, &c. Of modern targets, the simplest is that used for Archery (q. v.). With regard to rifle targets, the spread of the Volunteer movement and the numerous rifle-matches have caused ranges to be constructed over the whole country. The necessities are: a butt, artificially constructed or cut in the face of a hill, to prevent wide balls from scattering—a marker's shot-proof cell, near the targets—and a range of such length as can be procured.

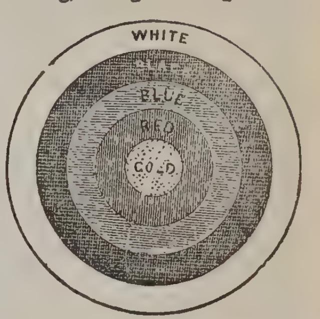


Fig. 1.—Archery Target.

The sizes of targets used by the British army are as follows: for firing up to 300 yards, the target is 6 feet high by 4 feet broad, with a bull's-eye 2 feet high by 1 foot broad; centre, 4 feet high by 2 feet broad. Up to 600 yards, the target is 6 square feet, bull's-eye, 2 square feet; centre, 4 square feet. Up to 800 yards, the target is 6 feet by 8; bull's-eye, 2 feet high, 3 feet broad; centre, 4 feet high, 6 feet broad. The marker signals the 'hits' from his box, denoting a bull's-eye by a red-and-white flag, a centre by a blue flag, and an outer by a white flag. If he shew a red flag, it is to cease firing while he inspects the target. In scoring, the outer counts 2; centre, 3; and bull's-eye, 4. A red flag should fly on the butt during the whole time of practice, to warn passers-by to keep off the range. Some of the targets used by the National Rifle Association at Wimbledon are different from those used by the army. The bull's-eye of the target used up to 300 yards is 8 inches square; centre, 2 feet square. The target up to 600 yards is the same

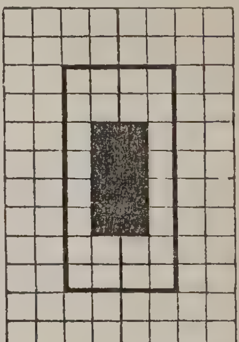


Fig. 2.
Target for distances up to 300 yards.

as in the army. For distances up to 1100 yards, the target is 6 feet high by 12 feet broad; bull's-eye, 3 square feet; centre, 6 square feet. The

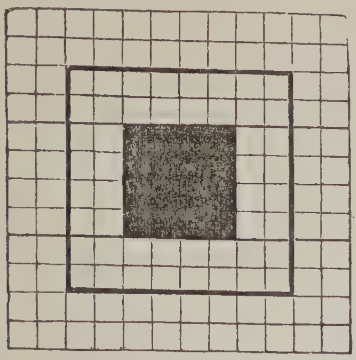


Fig. 3.—Target for distances up to 600 yards.

system of signalling is that invented by Captain Hill of Brentwood, Essex. The mantelet, or butt for the marker, is placed close up to one side of the target, a little in front; the marker is protected from the splash of the bullet by a shield, he having

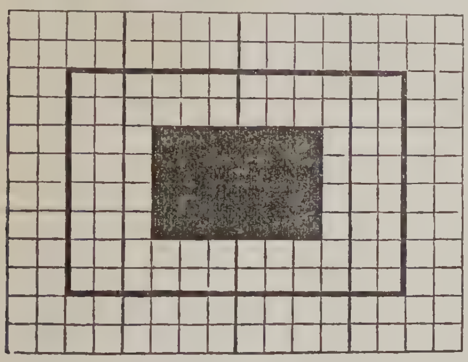


Fig. 4.—Target for distances up to 900 yards.

a full view of the target through a small pane of thick glass, wiping out each shot-mark, through a slit in the shield, with a brush placed on the end of a pole; at the same time, the value of the shot is shewn by a coloured disc attached to the pole.

Various descriptions of targets have been made by which the value of the shooting is denoted by electric apparatus, or by signals worked by machinery placed behind the target. In artillery practice, targets of considerable size are used at long ranges. The usual practice is over the sea; targets are then painted on the sides of old vessels, or are floated by buoys. For trying the power of ordnance, solid targets are constructed to resemble the sides of iron-plated ships, portions of fortification, &c.

TARGOWI'TZ, or TARGOWICZA, in Russia, a small town in the government of Kiev (q. v.), on the borders of Kherson, was the scene (May 1792) of a confederation ('plot' as the patriots had it) of the five Polish nobles (Potocki, Branecki, Bzeureski, and two others of little note) who were adverse to the constitution of 3d May 1791. They were incited to this traitorous conduct towards their country by Catharine II., and after their conduct had been fully unveiled, they were declared traitors to their country, and only escaped death by precipitate flight to Russia, where they were munificently rewarded for the treason which had given the czarina a pretext for executing the second partition of Poland (q. v.).

TA'RGUM (Chaldee, from *tirgem*, a word of uncertain origin, designating to translate, explain), the general term for the Aramaic Versions of the Old Testament, which became necessary when after, and perhaps during the Babylonian Exile, Hebrew began to die out as the popular language, and was supplanted by 'Chaldee,' an idiom, or rather a family of idioms, on which we have spoken under SHEMITIC LANGUAGES.

The origin of the Targum itself is shrouded in mystery. The first signs of it—as an already fixed institution—have been found by some in the book of Nehemiah, and according to tradition, Ezra and his coadjutors were its original founders. However this be, there can be no doubt that its beginnings belong to a comparatively early period. The Mishna (q. v.) contains a number of strict injunctions respecting it, and also respecting a certain guild of Meturgemans (whence dragoman) or interpreters, who had sprung up as professional followers of those learned men who, at a previous period, had volunteered their services in the translation and paraphrastic interpretation, both activities, as we said, implied by the term. At first, and indeed for many centuries, the Targum was not committed to writing, for the same reason that the 'Oral Law' itself was not at first intended ever to become fixed as a code for all times. In the course of time, however, both had to yield to circumstances, and their being written down, was considered preferable to their being utterly forgotten, of which there was no small danger. Yet a small portion only of the immense mass of oral Targums that must have been produced, has survived. All that is now extant are three distinct Targums on the Pentateuch, a Targum on the Prophets, Targums on the Hagiographa, viz., on Psalms, Job, Proverbs, the five 'Megilloth' (Song of Songs, Ruth, Lamentations, Esther, Ecclesiastes), two Targums on Esther, one on Chronicles, one on Daniel, and one on the apocryphal pieces of Esther. The most important of the three Pentateuch Targums is the one named after Onkelos (q. v.), probably a corruption of Akylas, whose Greek version had become so popular that this Chaldee version was honoured with being called after it. In its present shape, this translation dates probably from the end of the 3d or beginning of the 4th c. A.D., although snatches of it were collected and written down more than a hundred years earlier. We have spoken of its language and its general character already under ONKELOS, and may here briefly state that it is composed in an Aramaic closely resembling that of Daniel, and that it is as excellent a translation 'for the people,' which it meant to be, as can well be conceived. Occasionally, when the subject imperatively demands it, it introduces some paraphrastic by-work, and it only deviates from the text where the divine dignity would have appeared to suffer in the eyes of the multitude by a literal interpretation. Its value for exegetical purposes is no less great than it would be for linguistic and antiquarian purposes, were it more explored with that view than has been the case as yet.

The two other Targums on the Pentateuch, hitherto known as Targum Jonathan ben Uzziel, and Targum Jerushalmi, are merely recensions of one and the same version—the name of the first recension being merely a perpetuated error of a single scribe—which owes its origin to Palestine or Syria (Onkelos being of Babylonian origin), and cannot well have been redacted before the 7th c. A.D. There is no doubt that originally this 'Jerusalem Targum' embraced

the whole of the Old Testament, as did the Babylonian; but nothing has survived beyond these two recensions of the Pentateuch, the first complete, the second in a fragmentary condition: the former probably intended as an emendation of Onkelos, chiefly in the direction of homiletic paraphrase and legendary lore, and the latter as a further emended emendation of single portions. As a version, this Targum is of small importance; but it is invaluable as a storehouse of allegories, parables, sagas, and the like popular poetry of its time. Its language and grammar are exceedingly corrupt; it abounds, moreover, with foreign—Greek, Latin, Persian, and Arabic—terms; and its general use lies more in the direction of Jewish literature itself, as well as of archæology and antiquities of the early Christian centuries, than in that of a direct interpretation of the Bible text itself. The Targum on the Prophets is generally and erroneously ascribed to Jonathan ben Uzziel, an eminent master of the law at the time of Hillel the Elder; the fact being that, except one spurious Talmudical passage, in which mention is made of his having translated the Prophets, this Targum is everywhere else, from the Talmud down to the authorities of the 10th c. A.D., ascribed to one R. Joseph, president of a Babylonian academy in the 4th century. And it would indeed seem as if this statement were completely in accordance with the real facts—if not the writing, but the collection and final redaction of this Targum is ascribed to him. Respecting the nature of this version, it may be said that, while being tolerably literal in the first—historical—books, it gradually becomes a mere framework of Midrash (q. v.) or Haggada, which it introduces at every turn and at great lengths. It further contains historical bits, disguised, or rather typified, and some lyrical pieces of rare poetical value. In language and general manner, it resembles Onkelos, with which it is of one growth, place, and date, and of which it forms only a kind of continuation.

To the same Joseph 'the Blind' to whom the redaction of the foregoing Targum is probably due, is further ascribed a Targum on the Hagiographa. But between him and the Hagiographical Targums lie, at the least, 600 years; their date being approximately given as about 1000 A.D. Certain distinctions between the different books must further be made. The Targums on Psalms, Job, and Proverbs were probably contemporaneous compositions due to Syria. The two former are made more paraphrastic than the last, which resembles closely the Syriac version. The paraphrase on the five 'Megilloth'—a very late production indeed—is principally a collection of more or less poetical fancies, traditions, and legends, to which the single verse in hand merely seems to furnish the key-note. There is, we need not add, but very little to be found in them of what originally must have formed the Targum on these books; nor is there the slightest hint to be found as to who was the real author or editor of their present form. That it was one man's work, is probable enough, from a certain unity of design and style noticeable in all of them. Their dialect lies somewhat between the East and West Aramaic. The Targum on the Book of Chronicles—almost unknown until the 17th c.—also belongs to a late period, and was probably composed in Palestine. There are some useful philological, historical, and chiefly geographical hints to be gleaned from it, but nothing more; least of all can it be used exegetically. A Persian version of a Targum on Daniel (unedited) is all that has been discovered on that book as yet. It was probably composed in the 12th c., the influence of the early Crusades being plainly visible in it. On the paraphrase of the apocryphal pieces of Esther, we shall not dwell here, any more than on the scanty fragments of a 'Palestinian Targum' that are found either interspersed in the general (Babylonian) Targum, or as independent pieces. It seems probable that more of this Palestinian version will come to light some day, as authorities of a few centuries back still quote from it rather largely. At present, however, their quotations are nearly all that remains.

Very little—we might say, next to nothing—has been done as yet to utilise this most important branch of Aramaic literature; in fact, not even an attempt at anything like a critical edition has been made, although it would be difficult to find a more corrupt text than that offered by the MSS. and single printed portions. Some parts have been done into Latin, English, German, &c. The ed. pr. of Onkelos is dated Bologna, 1482; that of the Targum on the Prophets, Leiria, 1494.

TARI'FA, a seaport town of Spain, 20 miles south-west of Gibraltar. It is the most southern town of Europe, is surrounded by tower-embattled walls, and communicates by a causeway with a small island, on which stand a fortress and lighthouse. The town is the most thoroughly Moorish in Andalucia; it is quadrangular in shape, and its streets are narrow and dark. Tunny and anchovy fisheries are actively carried on. Pop. 8100.

T., the Carthaginian *Josa*, and the Roman *Julia Traducta*, received its present name from the Moors, who are said to have called it after Tarif (= Tarik ?) Ibn Malik, who landed there to reconnoitre previous to the conquest of the country. See MUZA; RODERIC. It was successfully defended in 1811 by 2500 troops (mostly British) against a French force of 10,000 men, under Victor and Laval.

TA'RIFF (from *Tarifa* (q. v.), where, during the rule of the Moors in Spain, duties were collected), a table or catalogue, generally drawn up in alphabetical order, of the duties, drawbacks, bounties, &c., charged or allowed on different kinds of merchandise, as settled by authority, or agreed to between different states. The principles of the tariffs of different countries depend on their respective commercial policy, and on the fluctuating interests and wants of the community. According to the presently existing British tariff, only 22 kinds of merchandise are subject to an import duty, and none to an export duty.

TA'RLATAN, a thin gauze-like fabric of cotton, used for ladies' ball-dresses, &c. It is usually dyed or printed in colours. Tarare, in France, is the chief centre of this manufacture, whence it is largely exported to Great Britain and other countries. Switzerland alone competes with France in the production of tarlatan, but those of the latter country far surpass the former in fineness.

TARN, a dep. in the south of France, bounded on the N. by the deps. of Aveyron and Tarn-et-Garonne, receives its name from the river Tarn. Area, 2216 sq. m.; pop. (1872) 352,718. The surface is in general elevated, and in the south and south-east are the Montagnes Noires and the Monts de l'Espinous, branches of the Cévennes. The rock of Montalet, the principal summit, is 4430 feet high. Wooded mountains, vine-clad hills, beautiful valleys, and fertile or grass-producing tracts, are the principal features of the landscape. The chief river is the Tarn, an affluent of the Garonne (q. v.), and which has a westward course of 200 miles. A fifth part of the surface is covered with forests, chiefly of oak and beech. The dep. is for the most part agricultural, and the most improved methods are in use. Eleven million gallons of wine are made in

average years. T. is divided into four arrondissements: Albi, Castres, Gaillac, and Lavaur. Albi is the capital.

TARN-ET-GARONNE, a small dep. in the south of France, bounded on the S.-E. by the dep. of Tarn. Area, 1435 sq. m.; pop. (1872) 221,610. The principal river is the Garonne, which flows north-west, and its affluents, the Tarn and Aveyron. The surface is marked by plateaux, about 1000 feet in average altitude; the highest hills do not rise above 1600 feet. The climate is beautiful, healthy, and temperate. Cereals are raised in great quantities. Of wine, 11,000,000 gallons are produced. The dep. is divided into the three arrondissements of Montauban, Castelsarrasin, and Moissac. Montauban is the capital.

TARNO'POL, a town of Austria, in Galicia, charmingly situated on the left bank of the Sered, 80 miles east-south-east of Lemberg. Agriculture employs the great mass of the inhabitants, and the horse-market held here periodically is the most important in Galicia. Horse-races also take place. Pop. 17,210.

TA'RNOW, a town of Austrian Galicia, near the right bank of the Dunajec, a navigable tributary of the Vistula, and 49 miles east of Cracow by the Vienna and Lemberg Railway. It is the seat of a Catholic bishop, contains a theological college, and a beautiful cathedral, in which are numerous monuments of marble, surmounted by statues, enriched with *bassi rilievi*, and rising to from 60 to 70 feet in height. Several industries are actively carried on, and there is a good general trade. Pop. (including suburbs) 16,400.

TARPAU'LIN, a large sheet of the coarsest kind of linen or hempen cloth, saturated with tar to render it waterproof. It is used for covering loaded wagons, the hatchways of ships, and similar things, as a temporary protection from wet.

TARPEI'AN ROCK (Lat. *Rupes Tarpeia*, or *Mons Tarpeius*), the name originally applied to the whole of the Capitoline Hill (see CAPITOL), but latterly confined to a portion of the southern part of the hill, the following being the legend commonly related in connection with it. In the time of Romulus, Tarpeia (a vestal virgin), the daughter of Sp. Tarpeius, governor of the Roman citadel on the Capitoline, covetous of the golden ornaments on the Sabine soldiery, and tempted by their offer to give her what they wore on their left arms, opened a gate of the fortress to the Sabine king, Titus Tatius, who had come to revenge the rape of the Sabine women. 'Keeping their promise to the ear,' the Sabines crushed Tarpeia to death beneath their shields, and she was buried in the part of the hill which bears her name. Subsequently, it was not unusual for persons condemned on the charge of aspiring to restore the monarchy, or of treason to the state generally, to be hurled from the T. R.—e. g., the famous Manlius, the saviour of the Capitol during the invasion of the Gauls.

TARQUI'NIUS, the family name of two kings of Rome, with whose history, or rather with the legends regarding whom, the fortunes of the city are closely interwoven. The story goes that Demaratus, a Corinthian noble, emigrated from Greece, and settled at Tarquinii, in Etruria, where he married an Etruscan wife, by whom he had two sons, Aruns and Lucumo. Aruns died during his father's lifetime, but Lucumo married into one of the noblest Etruscan families. His wife, named Tanaquil, was a bold, ambitious, and wise woman. By her advice, Lucumo resolved to go to Rome. He set out, accompanied by a large train of followers, and as he approached the Janiculum, an eagle swooped down, and snatching off his cap, carried it up to a great height, then descending, placed it on his head again. Tanaquil, who was deeply skilled in the science of augury, prophesied from this omen the highest honours for her husband, who was hospitably received at Rome, and soon after admitted to the rights of citizenship, whereupon he took the name of L. Tarquinius, or, according to Livy, L. Tarquinius Priscus. The Roman monarch, Ancus Marcius, appointed him guardian of his children; and on the death of the former, the senate and the citizens unanimously elected him to the vacant throne. His reign was a glorious one. Against the Latins, Sabines, and (according to Dionysius) the Etruscans, he waged successful war, forcing the whole of the twelve sovereign cities of Etruria to recognise his supremacy, and do him homage. But the works that he executed at home are even more renowned than his exploits abroad. To L. Tarquinius Priscus (*Priscus* is commonly translated the 'Elder;' but Niebuhr objects to this translation as involving an anachronism, and notices the fact that *Priscus* is a common cognomen among the Romans) are ascribed the construction of the magnificent *Cloacæ*, or sewers (see, however, CLOACA MAXIMA), which remain uninjured to this day; the laying out of the Circus Maximus and the Forum; the institution of the great or Roman games; and (some say) the building of the Capitoline temple (see CAPITOL). The legend also represents him as effecting certain political and sacerdotal changes. See ROME. T. was assassinated after a reign of 38 years, at the instigation of the sons of Ancus Marcius, who considered themselves as best entitled to the throne, and dreaded lest he should use his influence to get his favourite and son-in-law, Servius Tullius, chosen as his successor. But their crime did not avail them, for, through the dexterity of Tanaquil, Servius was elected to the vacant throne, and signalised himself not only by his military exploits, but also by great organic changes in the Roman constitution (see article ROME for an account of the 'Servian Reform'). T. left two sons, L. Tarquinius Superbus and Aruns, both of whom married daughters of Servius Tullius; and two daughters, one of whom married Servius Tullius himself and the other M. Brutus, by whom she became mother of L. Brutus, first consul of the Roman Republic.

L. TARQUINIUS SUPERBUS, son of the preceding, having murdered his father-in-law, Servius Tullius, at the instigation of his wife, is represented in the legend as audaciously usurping the vacant throne; but as the whole drift of his legislative policy was to abolish the reforms of Servius, there can be little doubt that the real significance of this part of his career lies in the fact, that it indicates a successful reaction, on the side of the patricians, against the more liberal and progressive policy of the preceding age. That the younger T., at least, is a historical character seems to be pretty generally allowed. The incidents of his career are so numerous and coherent, and the impress of his name and character is so deeply stamped on the national memory, that he cannot be regarded as a wholly imaginary personage. Analyse the story how we may, there will always remain a residuum of insoluble fact, not essentially at variance with the character of the tragic tradition. As far as we can gather from the ancient annals, the usurpation of T. was probably achieved by the help of an enterprising section of the nobles, who clung tenaciously to their privileges, and could not endure the constitutional recognition of the *plebs*. It does not appear that the whole of the senators connived at or even approved of T.'s

procedure. We are expressly told that he drove numbers of those whom he mistrusted into exile; in other words, he persecuted and banished the adherents of the Servian policy of conciliation. Like a Turkish tyrant, he surrounded himself with a body-guard—another indication of the original insecurity of his position, and strengthened himself by foreign alliance, marrying his daughter to Octavius Mamilius, Prince of Tusculum. By means of subtle and unscrupulous intrigues, he obtained or consolidated the Roman hegemony in Latium; offered sacrifice in the name of all the Latins at the Alban Mount; fused the contingents of the latter with the Roman legion; put to death as traitors such of their chiefs as opposed him (e. g., Turnus Herdonius); and, at the head of the combined forces, penetrated into the Volscian marshes, and subdued the natives. On his return, he completed the building of the Capitol, which the Elder T. had begun, and deposited in the vaults the Sibylline books he had curiously acquired. See Sibyl. He next conquered the town of Gabii (where many of the banished nobles had found shelter), through an elaborate stratagem, in which his son Sextus played the principal part. But his lavish expenditure both in war and peace necessitated the imposition of heavy taxes, and murmurs of discontent were heard among the people. The patience both of plebs and patricians was beginning to give way. Coincident with this state of things, a fearful omen was beheld: from the altar in the royal palace crept forth a serpent, and devoured the entrails of the victim. T. sent two of his sons, Titus and Aruns, to Delphi to consult the oracle. They were accompanied by their cousin, L. Junius Brutus (q. v.), who had long feigned himself a fool in order to save his life, for T. had killed his father and brother in order to possess himself of their great wealth. On their return, they found that the king had opened war upon the Rutuli, and was besieging Ardea, whereupon they joined the Roman camp. Here occurred, between Sextus and Collatinus, the famous dispute about the virtues of their respective wives, which led to the rape of Lucretia. The details of this legend are so familiar that it is unnecessary to recount them. Suffice it to say that it roused such a storm of indignation, that the people of Collatia (where the shameful deed was done) rose in arms, and renounced their allegiance to Tarquinius. Brutus carried the news to Rome, and the senate, fired with a righteous anger, deposed the tyrant; finally, the army before Ardea also revolted. T. and his sons were obliged to flee, and an aristocratic republic was constituted at Rome. Three different attempts were made to restore T. by force: first, by his own Etruscan kinsmen of Tarquinii; second, by Lars Porsena (q. v.) of Clusium; and third, by his son-in-law, Octavius Mamilius, 'prince of the Latian name,' all of which, according to the legend, failed; and at length T., utterly baffled and beaten, retired to Cumæ, where he died, a wretched and childless old man, for all his sons had met death before him.

TA'RRAGON. See Artemisia.

TARRAGO'NA, a seaport of Spain, chief city of the modern province of the same name, stands on the Mediterranean shore, at the mouth of the Francoli, 60 miles west of Barcelona. It consists of two portions—the upper (the ancient) and the lower (the modern) towns. The former stands on a hill 720 feet high, and is girdled with ramparts. The lower town, completely separated from the higher by a line of works, is regular and open, and is defended by two forts. The beautiful cathedral, in Gothic and Norman, and which dates from the middle of the 12th c., is the principal edifice. Of its industries, brandy-distilling and the manufacture of olive oil are the chief. The harbour is safe for the vessels that visit Tarragona. Population about 19,500.

T., called by the Romans *Tarraco*, was founded by the Phœnicians (who called it *Tarchon*, citadel), and afterwards became the capital of the Roman province of Tarraconensis. Among the Roman antiquities are the remains of an amphitheatre, which has been used as a quarry; a magnificent aqueduct, 96 feet high, and 700 feet long—still in use—and near the town the Tower of the Scipios, much decayed. T. was taken and cruelly sacked, in June 1813, by the French under Suchet.

TA'RRYTOWN, a village of New York, U. S., on the east bank of the Hudson River, 27 miles north of New York city. It is beautifully situated on a lake-like expansion of the river, called the Tappanzee, surrounded with fine scenery, and filled with elegant residences. It has 6 churches and 4 academies, and is noted as the scene of the capture of Major André. Pop. (1880) 3025.

TA'RSHISH, probably the same as *Tartessus*, a city and emporium of the Phœnicians in Spain, somewhere near the mouth of the Guadalquivir. It is frequently mentioned in Scripture, notably so in connection with the prophet Jonah, who took ship for T. when he sought to 'flee from the presence of the Lord.'

TA'RSIA-WORK, a beautiful kind of marquetry made in Italy. It is produced by inlaying pieces of coloured wood so as to represent figures and landscapes. That of Sorrento is very celebrated; and lately, many fine pieces of this work have been made in Perugia. It is usually applied to the decoration of cabinet-work.

TA'RSUS, anciently the chief city of Cilicia, and one of the most important in all Asia Minor, situated on both sides of the navigable river Cydnus, in the midst of a beautiful and productive plain, and about 18 miles from the sea. It was a great emporium for the traffic carried on between Syria, Egypt, and the central region of Asia Minor. In the time of the Romans, two great roads led from T., one north across the Taurus by the 'Cilician Gates,' and the other east to Antioch by the 'Amanian' and 'Syrian Gates.' T., judging from its name, was probably of Assyrian origin; but the first historical mention of it occurs in the *Anabasis* of Xenophon, where it figures as a wealthy and populous city, ruled by a prince tributary to Persia. In the time of Alexander the Great, it was governed by a Persian satrap; it next passed under the dominion of the Seleucidæ, and finally became the capital of the Roman province of Cilicia. At T, Antony received Cleopatra, when she sailed up the Cydnus, with magnificent luxury, disguised as Aphrodite. Under the early Roman emperors, T. was as renowned for its culture as for its commerce, Strabo placing it, in respect to its zeal for learning, above even Athens and Alexandria. It was the birthplace of the Apostle Paul, who received the greater part of his education here; and here the Emperor Julian was buried. Gradually, during the confusions that accompanied the decline of the Roman and Byzantine power, it fell into comparative decay; but even yet, it is—under the name of *Tarso* or *Tersus*—the most considerable place in the south-east of Asia Minor, has a pop. of 30,000 (in winter); and exports corn, cotton, wool, copper, gall-nuts, wax, goats' hair, skins, hides, &c.

TA'RTAN, or PLAID, a pattern woven in cloth, in which bands of different colours are woven or printed side by side, both the warp and weft way

of the material, thus giving the well-known checkered pattern. This is probably the oldest pattern ever woven; at all events, the so-called shepherd's plaid of Scotland is known to have a very remote antiquity amongst the eastern nations of the world. The plaid pattern admits of a very great variety of modifications, by the introduction of different colours, and by varying the amount of each colour employed. These coloured plaids were in great favour in the Highlands of Scotland, where each clan wore a particular kind as its distinctive dress.

TA′RTAR, a mixture of bitartrate of potassium and tartrate of calcium (see TARTARIC ACID), is a deposit formed from wine, and known in its crude form as Argol (q. v.). About 900 tons annually of this substance are imported into Great Britain, from the chief wine-producing countries of Europe and the Cape of Good Hope.

The word *Tartar*, which gives the name to tartaric acid, is derived from the Greek *Tartaros*, hell. 'It is called *Tartar*,' says Paracelsus, 'because it produces oil, water, tincture, and salt, which burn the patient as Tartarus does.'

TARTAR, CREAM OF. See TARTARIC ACID.

TARTAR, FOLIATED EARTH OF, an old name for acetate of potash, in consequence of the foliated satiny masses in which that salt occurs.

TARTAR OF THE TEETH is a deposit of salts of lime and organic matter from the saliva, and usually occurs most abundantly on the inferior incisors. If it is suffered to accumulate, it causes inflammation and absorption of the gum, and gradual loosening of the teeth. The accumulating of this substance may usually be prevented if due attention is paid to the cleaning of the teeth. 'The teeth,' says Dr Druitt, 'should be cleaned at least twice a day with a soft tooth-powder (precipitated chalk is best) and a little soap. The hairs of the tooth-brush should be soft, and not too closely set, so that they may penetrate the better into the interstices of the teeth.' When the tartar has accumulated to any extent, it must be removed by the *scaling instruments* of the dentist.

TARTAR, SOLUBLE, a term applied by some chemists to neutral tartrate of potash, and by others to borotartaric acid. See TARTARIC ACID.

TARTA′RIC ACID. Ordinary tartaric acid, $C_4H_6O_6.H_2O$, is usually seen in the form of colourless, transparent, oblique, rhombic prisms, which are not affected by the action of the air, have an agreeable acid taste, and are soluble in water and alcohol. The crystals when gently warmed become strongly electric, the opposite sides of the crystals exhibiting the opposite forms of electricity. On heating tartaric acid to about 340°, it fuses; and at a slightly higher temperature, it becomes successively changed, without losing weight, into two metameric acids, *metatartaric* and *isotartaric* acids, the former of which is bibasic and the latter monobasic. At about 374°, two atoms of the acid lose one equivalent of water, and *ditartaric acid*, $C_8H_{10}O_{11}.H_2O$, is formed. If the same temperature be maintained a little longer, half the basic water is expelled, and *tartrelic acid*, $C_4H_4O_5.H_2O$, is formed; and finally, all the basic water is driven off, and *anhydrous tartaric acid*, or *tartaric anhydride*, $C_4H_4O_5$, remains in the form of a white porous mass insoluble in water, alcohol, or ether. If, however, it be allowed to remain long moist, it gradually becomes converted into crystallised tartaric acid. Finally, on distilling tartaric acid in a retort at a temperature of 400° and upwards, it is decomposed into certain gases and empyreumatic oily matters, water, and acetic, pyruvic (or pyroracemic), and pyrotartaric acids.

Oxidising agents, such as peroxide of lead or nitric acid, readily act upon tartaric acid, and convert it into formic and carbonic acids; and when fused with caustic potash, it splits up into acetic and oxalic acids. It is one of the strongest of the organic acids.

This acid occurs abundantly in the vegetable kingdom both in the free and combined state. It is found as a free acid in tamarinds, grapes, the pine-apple, &c.; and in combination with potash and lime in tamarinds, grapes, mulberries, and the unripe berries of mountain-ash, and in small quantity in the juice of many other vegetables. It is, however, from Argol (q. v.), a product of the fermentation of grape-juice, that the tartaric acid of commerce is obtained. The details of the process may be briefly described as follows: Argol, or crude bitartrate of potassium, is dissolved in boiling water, and chalk is added as long as effervescence occurs. An insoluble tartrate of calcium is precipitated, and tartrate of potassium remains in solution. This tartrate of potassium is converted, by the addition of chloride of calcium, into insoluble tartrate of calcium and soluble chloride of potassium. The tartrate of calcium obtained by these two operations, if treated with sulphuric acid, readily yields free tartaric acid in solution, with sulphate of calcium as a precipitate. The filtered liquid, when cooled and evaporated, yields tartaric acid in crystals.

Tartaric acid is used in large quantity by calico-printers and dyers for the removal of certain mordants, and is much employed in medicine in the preparation of effervescing draughts and for other purposes.

Tartaric acid is tetratomic, and for the most part dibasic, two of the hydrogen-atoms being easily replaced by metals, and the other two by alcoholic acid radicles. With monatomic metals it forms acid, neutral, and double salts; thus with potassium it forms acid tartrate of potassium ($C_4H_5KO_6$), neutral salts of potassium ($C_4H_4K_2O_6$), and tartrate of sodium and potassium, or Rochelle salt ($C_4H_4KNaO_6.4H_2O$). With diatomic metals it forms neutral salts and double salts, viz., neutral tartrate of barium ($C_4H_4Ba_4O_6$), and tartrate of barium and potassium ($C_8H_8Ba''K_2O_{12}$). With triatomic metals it forms a peculiar class of salts, best known in the case of antimony, the acid tartrate of which is $C_4H_5(SbO)O_6$, tartrate of potash, and antimony (tartar emetic) ($C_4H_4K(SbO)O_6$), and neutral tartrate of antimony ($C_4H_4(SbO)_2O_6$). The neutral tartrates of the alkali metals are very soluble in water, but all tartrates are insoluble in alcohol. The neutral tartrates of the earth metals and heavy metals are mostly of sparing solubility in water.

Tartrate of potassium, $C_4H_4K_2O_6$, a soluble salt, which crystallises with difficulty, and is formed in preparing tartaric acid from *bitartrate of potassium*, $C_6H_5KO_6$. This salt is prepared from argol by extraction with boiling water, which dissolves about one-sixth of its weight. As it is much more insoluble in cold water, of which it requires 240 parts, it crystallises readily as the hot solution cools. The snowy white rhombic prisms which are thus deposited constitute *cream of tartar*. When heated to redness in a covered crucible, a charred mass, consisting of carbonate of potassium and charcoal in a fine powder, remains, and is used in the laboratory for reducing operations under the title of *black flux;* and if cream of tartar is deflagrated with twice its weight of nitre, *white flux*, also a reducing agent, consisting solely of carbonate of potassium, is obtained. *Tartrate of potassium and sodium* has been already described in the article ROCHELLE SALT. *Tartrate of potassium and iron*, or *Ferrum tartaratum*, $C_4H_4K(FeO)O_6$, and *Tartrate of ammonium and iron*, or *Ammonio-tartrate of iron*, $C_4H_4(NH^4)(FeO)O_2$, although the

latter is not included in the Pharmacopœia, are excellent medicinal preparations of iron. For the method of preparing them, the reader is referred to Neligan's *Medicines*, 6th ed. p. 658, &c. They occur in the form of brilliant, semi-transparent, reddish-brown scales, and are soluble in about their own weight of water at 60°. *Tartrate of potassium and boron*, known also as *soluble tartar* (although the term has also been applied to tartrate of potassium), or *soluble cream of tartar*, $C_4H_4K(BO)O_6$, has been employed medicinally, but is not now used. *Tartrate of antimony and potassium*, known also as *tartarised antimony* and *tartar emetic*, $C_4H_4K(SbO)O_6.\frac{1}{2}H_2O$, is one of the most valuable articles in the whole *Materia Medica*. This salt, obtained by a process which is given in the Pharmacopœia, occurs in the form of square prisms, which are soluble in about 15 parts of cold water and in 2 parts of boiling water. This salt is somewhat efflorescent, and when dried at 212°, loses all its water of crystallisation; its solution slightly reddens litmus, throws down an orange-coloured sulphide of antimony, if a current of sulphuretted hydrogen is passed through it, and has a very peculiar nauseous, metallic taste.

There is no very delicate test for tartaric acid. Its presence in a moderately strong solution may be detected by the addition of acetate of potassium, when a sparingly soluble bitartrate is soon separated, especially if the mixture be well stirred. All the tartrates on charring emit a peculiar odour resembling that of burned sugar.

A remarkable metameric modification of tartaric acid is known as *racemic* or *paratartaric acid*, or *uvic acid*, $C_4H_6O_6$. It is a frequent associate of tartaric acid, but is especially abundant in the grapes of the Vosges district. While in most respects it exhibits a close resemblance to tartaric acid (the two acids having the same composition, yielding, when exposed to heat, the same products, and their salts corresponding in the closest manner), it may be distinguished and separated from it by the following points of difference. It crystallises more readily from solution; it contains two equivalents of water of crystallisation; it is less soluble in alcohol; and the racemate of calcium is soluble in hydrochloric acid, and is precipitated unchanged on adding ammonia. Its most important difference, however, is, that its solution does not rotate the plane of polarisation, while a solution of ordinary tartaric acid exerts a well-marked right-handed rotation.

The brilliant researches of M. Pasteur on the optical and chemical properties of tartaric and racemic acids, have opened up a new and most important field of investigation in relation to the molecular composition of organic bodies. We shall give the briefest possible abstract of his remarkable discoveries, and must refer for fuller information to his numerous Memoirs in the *Comptes Rendus*, *Annales de Chimie*, and other French scientific journals. He has proved that racemic acid is a mixture of ordinary tartaric acid (to which, from its optical property, he applies the term *dextro-racemic acid*) and of an acid which produces left-handed rotation, to which he gives the name *lævo-racemic acid*. (These acids are also known as *dextro-tartaric* and *lævo-tartaric acids*.) He found that, by saturating racemic acid with soda and ammonia, and allowing this solution to crystallise slowly, two varieties of crystals are obtained, which may be distinguished by their form, in the same way as the image and the reflection of the image in a mirror differ; or as right-handed and left-handed. If the two kinds of crystals are separated, and then dissolved, each solution is found to act powerfully on polarised light, but in opposite directions. On separating these acids from their bases, and mixing equal parts of concentrated solutions of each, racemic acid is again formed, which exerts no action on a polarised ray. M. Pasteur has subsequently made the discovery, that racemic acid may be artificially produced by the action of heat upon certain compounds of tartaric acid (such as tartrate of cinchonine or tartaric ether), which are capable of resisting a high temperature. The formation of racemic acid in this way is accompanied by the production of another modification of tartaric acid, which he calls *inactive tartaric acid*, which, like racemic acid, has no action on polarised light, but, unlike it, cannot be resolved into dextro and lævo racemic acids.

Tartaric acid and the tartrates, in their relation to medicine, are of considerable importance. Pure *tartaric acid*, in small doses diluted largely with water, forms a good refrigerant drink in febrile and inflammatory affections, and is much employed for this purpose in hospitals, &c., as being cheaper than citric acid. It has been stated that persons addicted to habitual drunkenness have been reclaimed by the following treatment. A few crystals of the acid are dissolved in two small tumblers of water, and taken in the morning fasting, an hour intervening between the tumblers. The painful feeling of sinking and craving of the stomach, of which such persons usually complain, is said to be removed by these acid draughts. Under the name of *acidulated drops*, lozenges composed of this acid, sugar, and oil of lemons, are largely employed in mild sore throats and colds. The principal medical use, however, of tartaric acid is in the preparation of effervescent draughts, when added to alkaline carbonates; and in the composition of Seidlitz Powders (q. v.). *Tartrate of potassium* is a mild but efficient purgative in doses of from two to six drachms, which is perhaps hardly so much used as it deserves. In passing through the system, it becomes converted into carbonate, and thus renders the urine alkaline. *Acid tartrate*, or *bitartrate of potassium*, commonly known as *cream of tartar*, in full doses, acts as a sharp purgative, but is generally prescribed with some of the milder vegetable cathartics. When administered in small repeated doses (from a scruple to a drachm), in a large quantity of water, it largely increases the secretion of urine, and is consequently of great service in dropsy. It may be agreeably given in either of the following forms: (1) *Imperial*, which is prepared by dissolving a drachm of cream of tartar in a pint of boiling water, and flavouring with lemon-peel and sugar. In incipient dropsy, a couple of tumblers of this mixture, with half a glass of good hollands in each, are strongly recommended by Dr Neligan as an after-dinner drink. The proportion of cream of tartar to the pint of water may be gradually increased to two drachms. (2) *Cream of tartar whey* is prepared by boiling 100 grains of the salt in a pint of new milk, and removing the curds by straining. Either of these drinks may be safely taken to any extent agreeable to the patient. *Tartrate of iron and potash*, the *Ferrum tartaratum*, or *Tartarated iron*, of the Pharmacopœia, is a mild chalybeate tonic, which, in consequence of its somewhat sweet taste, is well adapted for children. It occurs in transparent scales of a deep garnet colour, is soluble in water, and sparingly soluble in spirit. The dose varies from five grains to a scruple, three times a day, either given with honey or treacle, or dissolved in some aromatic water. The *wine of iron* (*Vinum Ferri* of the *Pharm. Brit.*) consists of sherry with tartrated iron in solution. Each drachm ought to contain one grain of the salt. The *tartrate of iron and ammonia*, or *ammonio-tartrate of iron*, closely resembles in its action the tartrate of iron and potash. Although

not in the *Pharm. Brit.*, it is 'an excellent preparation of iron, void of all astringency. Its not disagreeable taste, its solubility in water, its compatibility with the alkaline carbonates, and the permanency of its composition, give it an advantage over most of the other preparations of iron. It is peculiarly suited as a tonic for those derangements of the uterine organs in which ferruginous salts are indicated.'—Neligan's *Medicines*, 6th ed. p. 645. The dose is from five to eight grains, and it may be prescribed in the form of powders, pills, or solution; or made into a bolus with honey. *Tartar emetic*, in doses of from $\frac{1}{12}$th to $\frac{1}{8}$th of a grain, frequently repeated, acts as a diaphoretic or sudorific; nausea sometimes accompanies the diaphoresis, but it has the advantage of increasing the tendency to perspiration. The addition of the compound tincture of lavender tends to prevent the supervention of vomiting. Tartar emetic in these small doses is of great service in febrile disorders, in the hæmoptysis of phthisis, in obstinate cutaneous diseases, &c. *Antimonial wine* consists of sherry holding tartar emetic in solution in the proportion of two grains to the ounce. The dose, to produce a diaphoretic action, is 20 or 30 minims every hour. If we require an expectorant action—as in acute pneumonia or bronchitis—the salt should be given in still smaller doses, as from $\frac{1}{16}$th to $\frac{1}{12}$th of a grain. Tartar emetic, in doses of two or three grains, dissolved in water, acts as a powerful emetic, and at the same time produces much nausea and depression, and not unfrequently purging. The vomiting seldom occurs till about twenty minutes after the draught has been taken. If tartar emetic is thus given at the commencement of febrile or inflammatory affections, it will often cut short the impending disease. With this view, it is employed in continued fever, croup, hooping-cough, &c. It used to be given to relax the muscular system, in cases of strangulated hernia and dislocation; but chloroform is far better for these objects. In cases of poisoning, it is inferior to sulphate of zinc. It is expedient to take the emetic dose in parts, as too powerful an effect is thus prevented. Two grains, which are generally sufficient, must be dissolved in eight ounces of water, of which a quarter should be taken every ten minutes till vomiting ensues. The patient should walk gently about his room between the doses. If a large dose (of one, two, or even three grains) be repeated every second hour, the nausea, vomiting, and purging (which often follows a full dose) cease after two or three such doses, and the main action seems to be exerted in depressing the circulation and lowering the pulse. Hence, tartar emetic given in this way is a direct sedative or contra-stimulant, and is of great service in pneumonia and pleurisy. 'As a contra-stimulant,' says Neligan, 'tartar emetic is given in doses of from half a grain to two grains every hour or second hour, dissolved in one or at most two ounces of orange-flower water. The first dose or two should not exceed half a grain, and the patient should not be permitted to drink, so as, if possible, to avoid the production of vomiting. When once a tolerance of the medicine is produced in the system, the quantity taken may be rapidly increased.'—*Op. cit.*, p. 418. Lastly, tartar emetic, when applied to the skin, produces a crop of pustules, which ulcerate, and discharge purulent matter. In consequence of this property, tartar emetic, either in the form of ointment or of saturated solution, is often employed as a counter-irritant in various affections of the viscera of the chest and abdomen, in diseases of the joints, &c. The *ointment* is applied by rubbing about half a drachm on the skin night and morning. In two or three days, pustules begin to appear, when the further application of the ointment should be temporarily suspended. The saturated solution is a cleaner preparation than the ointment, and acts more speedily. It is applied by means of pledgets of lint soaked in it. Tartar emetic, in excessive doses, or in small repeated doses, acts as an irritant poison. Dr Taylor has reported 37 cases of poisoning by this agent, of which 16 were fatal. The smallest fatal dose was in a child *three-quarters of a grain*, and in an adult *two grains*, but in the last case there were circumstances which favoured the fatal action of the poison. The symptoms occurring in chronic poisoning by this salt are 'great nausea, vomiting of mucus and liquids, great depression, watery purging, followed often by constipation of the bowels, small contracted and frequent pulse, loss of voice and muscular strength, coldness of the skin, with clammy perspiration, and death from complete exhaustion.' A considerable number of cases are on record in this country in which murder has been perpetrated by the slow action of tartar emetic. The most important of them are referred to by Dr Taylor in his *Medical Jurisprudence*, pp. 146 and 250, to which must be added the Pritchard case in Glasgow (1865). The *Pharmaceutical Journal* for October 1865 contains directions, by Messrs T. and H. Smith of Edinburgh, for preparing an antidote to be prescribed after a large dose of tartar emetic has been taken. The ingredients are solution of perchloride of iron and calcined magnesia.

TA'RTARS, or, more properly, TATARS, was originally a name of the Mongolic races, but came to be extended to all the tribes brought under Mongolic sway by Genghis Khan and his successors, including Tungusic and Turkic races. The term is therefore not to be considered as ethnological, though all, or almost all, the peoples included under it, in its widest sense, belong to the Turanian family, but is rather to be understood in the same sense as the term 'Franks' used by Mohammedans. In the classification of languages, Tataric has become the distinctive name of that class of Turanian languages of which the Turkish is the most prominent member, while the Mongolic form a separate class. See TURANIAN LANGUAGES.

TA'RTARUS (Gr. *Tartaros;* the name is probably onomatopœic, the reduplication being designed to express something *terrible* or disagreeable, like *Barbaros*, *Karkaron*, and many other words), according to Homer, is a deep and sunless abyss, as far below Hades as earth is below heaven, and closed in by iron gates. Into T., Zeus hurled those who rebelled against his authority, as, e. g., Kronos and the Titans. Afterwards the name was employed sometimes as synonymous with Hades or the underworld generally, but more frequently to denote the place where the wicked were punished after death—Lowest Hell, in fact. A noticeable feature about these punishments is their congruity with the nature of the offences perpetrated. See HEAVEN and HELL.

TA'RTARY (properly TATARY) is the name under which, in the middle ages, was comprised the whole central belt of Central Asia and Eastern Europe, from the Sea of Japan to the Dnieper, including Mantchuria, Mongolia, Eastern Turkestan, Independent Turkestan, the Kalmuck and Kirghis steppes, and the old khanates of Kasan, Astrakhan, and the Crimea, and even the Cossack countries; and hence arose a distinction of T. into European and Asiatic. But latterly the name T. had a much more limited signification, including only that tract bounded on the N. by Siberia, and on the S. by China and Tibet, along with Independent Turkestan; and at the present day, many writers apply it as a synonym for Turkestan (q. v.).

TARTRA'LIC ACID. See TARTARIC ACID.

TARTRE'LIC ACID. See TARTARIC ACID.

TARTUFFE, the name of the chief character in Molière's most celebrated comedy, which has become a synonym in all languages for a hypocritical pretender to religion. The original of the character was most probably a certain Abbé de Roquette, a parasite of the Prince de Conti. The name is said to have suggested itself to Molière on the occasion of a visit to the papal nuncio, where he saw the pious and solemn countenances of the nuncio's courtiers suddenly lighted up with ecstatic animation by the appearance of a seller of truffles—in Italian, *tartuffoli*. This play excited a greater commotion than perhaps any other production of the kind ever did. It was written in 1664; but before it was brought on the public stage, partial representations of it in private companies had made its character known, and raised the alarm of the priests, who believed themselves to be specially satirised therein. Uniting with the many enemies whom Molière had already made for himself by lashing physicians, fops, and fools of all kinds, they used every means in their power to prevent the public representation of the play. The Archbishop of Paris threatened with excommunication all actors who should take any part in the performance, and even those who should only read it; and one dignitary went so far as to declare that Molière—whom he called a devil in human form—was deserving of the stake. It was not till 1669 that Molière succeeded in getting the play publicly acted in presence of Louis XIV.; and then it had an uninterrupted run for three months, to the great vexation of all hypocrites.

TASHKE'ND, a town (till 1865) of the khanat of Khokan, in Independent Turkestan, 92 miles north-north-west of Khokan, the capital, is situated on the north bank of the Saralka, a small feeder of the Djirhik River, an impetuous torrent, which empties itself into the Sir-Daria. It is the chief commercial town in the khanat, is the centre of the transit-trade between Bokhara, Khokan, and Chinese Tartary, and has extensive trading relations with Orenburg and Petropavlovsk. This commercial eminence renders it one of the most important cities of Central Asia. Vambery (*Travels in Central Asia* during 1863), who supplies us with the above information, does not describe the town or estimate its population; but from older authorities we learn that, like most of the cities of Central Asia, it stands in a fertile plain, is protected by a high wall of sun-dried bricks, 12 miles in circumference, through which entrance is obtained by 12 gates. Within the walls are numerous gardens and vineyards, interspersed among the houses; the houses themselves are built of mud, and thatched with reeds. The streets are narrow and dirty. The chief buildings are the castle—which is fortified, and is now the residence of the governor—various mosques, colleges, old temples, and a bazaar. The chief manufactures are gunpowder, silk and cotton goods, and iron. By a census taken in 1871 the population was 78,125. T. is also important in a military point of view, as the key to the khanats of Khokan and Bokhara, and mainly for this reason was long coveted by Russia. It was captured by the Russians in 1854, but soon relinquished; was retaken June 15, 1865, and the state of Khokan was annexed to Russia.

TASMA'NIA, formerly VAN DIEMEN'S LAND, a considerable island in the South Pacific Ocean, between the parallels of 40° 40'—43° 40' S. lat., and between 144° 30'—148° 30' E. long, lying to the south ot, and separated from Australia by Bass's Strait. Its greatest length, from Cape Grim, on the north-west, to Cape Pillar, on the south-east, is 240 miles; and its greatest breadth from east to west, 200 miles; its area, including the adjacent islands, about 26,300 sq. miles. The capital is Hobart Town, with a pop. of 19,449, situated at the base of Mount Wellington, on the western shore of the estuary of the river Derwent. The second chief town is Launceston, with a pop. of 10,359, situated at the head of the estuary of the Tamar, formed by the junction of the North and South Esk rivers. In the year 1870, the population consisted of—males, 52,853; females, 46,475; a total of 99,328 souls. In 1881 the total population amounted to 115,705, of whom 61,162 were males, and 54,543 were females. Hobart Town and Launceston are connected by the electric telegraph, and by a railway 133 miles in length. A line 45 miles long also connects Launceston and Deloraine, and a line of 30 miles connects Deloraine with the Mersey.

Physical Features.—The south-eastern coast of T. is deeply indented by the estuaries of the Derwent and Huon, Storm Bay, the inlet of Pitt Water, and Frederick Henry Bay. The last is protected on the south-east by Tasman's Peninsula, reserved as a penal settlement for the colony. The chief indentations on the west coast are Macquarie Harbour (formerly a penal settlement, but now uninhabited), and Port Davey. On the east coast are Oyster Bay, between Freycinet's Peninsula and the mainland; and Spring Bay, sheltered on the east by Maria Island. On the north coast, besides the estuary of the Tamar, there are numerous smaller harbours and rivers, accessible to vessels of from 30 to 300 tons. The chief of these are Circular Head, Port Sorell, and the rivers Mersey, Forth, Leven, Don, and Inglis. The scenery is of a bold mountainous character, varied by deep narrow valleys, extensive undulating tracts of country, and open plains of limited extent. Among the principal mountains are Ben Lomond (5002 feet), Cradle Mount (5069 feet), Ironstone Mount (4736 feet), Mount Barrow (4644 feet), Mount Wellington (4166 feet), with many others exceeding 4000 feet in height. Embosomed among the central mountains, at an average height of about three thousand feet, are numerous lakes, with a united area of about 170 sq. m., which feed the greater part of the rivers draining the south-east slope of the island. With the exception of the reclaimed lands, the basaltic plains, and limited tracts which are unfavourable to the growth of timber trees, the whole island is more or less densely wooded. The vast forests of the western portions of the north and south coasts are extensively utilised for timber, and in the former, the work of reclaiming the rich heavily-timbered lands is rapidly progressing. But the major part of the western half of the island is entirely uninhabited, its soil, climate, and inaccessible position offering little inducement to the settler.

Geology and Mineralogy.—A geological survey of Tasmania was commenced in 1859. The bed-rocks of the western districts of the island, from Bass's Strait to South-west Cape, consist of vast bands of slates, schists, and quartz rock, belonging to the Azoic or Metamorphic series. Next to these come Lower Palæozoic slates, with conglomerates and dark compact limestones, the latter highly charged with Silurian fossils. Unconformably upon the upturned edges of these rocks lie Upper Palæozoic sandstones, mudstones, limestones, and conglomerates, also traversed by dykes and masses of greenstone and basalt, and with these, reaching an altitude of 4000 feet above the sea-level. In the south-east districts, from the South Esk River on the north to the Huon on the south-west, the lower rocks are entirely absent, or

concealed beneath the Upper Palæozoic beds. In the north-east district, the lower rocks again make their appearance, associated with granite and greenstone, and occasionally traversed by dykes and veins of the true auriferous quartz. Here, again, they are overlaid by Upper Palæozoic rocks, extensively denuded, and exposing seams of coal from 2 feet to 14 feet thick, at various elevations. Tertiary rocks are sparingly distributed. At the mouth of the river Inglis, on the north coast, are beds of a whitish freestone, attaining in places a thickness of 120 feet, and containing recent shells, with extinct species of *Trigonia*, *Terebratula*, *Cypræa*, *Voluta*, &c. Tertiary lignites are found in the sandy clays of the valleys of the Derwent and Tamar, with impressions of leaves of unknown trees and plants. Over the greater part of the basin of the South Esk, comprising an area of more than 1000 sq. m., extensive deposits of clays, sands, and quartz drift are met with. No distinct traces of glacial action have been observed; but the thick beds of gravel, and the boulders, which must have travelled many miles from their parent rock, afford evidence of some powerful transporting agency, and were probably deposited in their present sites by the action of icebergs slowly drifting northwards at some period prior to the last general elevation of the land.

The igneous rocks are everywhere present in great variety. The islands of the Furneaux group in Bass's Strait are chiefly of granite, and form the connecting links which join the north-east angle of T. to the Great Dividing Range of Eastern Australia. The auriferous drifts of Fingal have for years given fair returns to a limited number of miners, and its quartz reefs and deep leads will yield gold in paying quantities, when enterprise and skill have been properly brought to bear upon them. Gold is also found in minute particles everywhere in the quartz drift of the South Esk basin, and on the north and west coasts; but the mode of its occurrence, and the geological indications, preclude the expectation that it will ever be profitably extracted. Silver, tin, and antimony have been occasionally met with in the gold drifts. Copper occurs in thin veins, associated with galena, on the north coast, near the river Leven, and galena has been found elsewhere in the primitive limestones. Red and brown hæmatites, containing a large percentage of iron, occur at various points on the north coast, in large masses and lodes. Coal is worked in several parts of the island, chiefly for local consumption. The older limestones yield fine varieties of marble, and excellent building-stone is obtained from the green-stones, basalts, and Palæozoic sandstones.

Botany.—The flora of T. has been fully described in the botany of the antarctic voyages by Hooker and others. The majority of the species are common to Australia and Tasmania. Of those which are peculiar to the latter, many are limited to particular localities. The most widely diffused genera are the Eucalypti and Acaciæ, the former yielding the ordinary timber of the colony. The Blue Gum (*Eucalyptus globulus*) reaches a height of 350 feet, with a corresponding girth. The Blackwood (*Acacia melanoxylon*) and the Huon Pine (*Dacrydium Franklinii*) also yield valuable timber, which, together with the hardwoods from the Eucalypti, is largely exported to the neighbouring colonies. A species of Beech (*Fagus Cunninghamii*), locally known as the myrtle, and growing in great abundance in some parts of the island, also produces a highly valuable timber, which has not yet received the attention which it merits. There are many beautiful shrubs and plants, but the flowers are usually small and inconspicuous. All the common fruit-trees and culinary vegetables of England have been introduced, and grow with great luxuriance and vigour. Oranges and lemons are cultivated in some situations, but do not usually ripen their fruit. The introduction and cultivation of exotic trees and plants are energetically carried on in the Botanical Gardens under the direction of the Royal Society.

Zoology.—Of the 40 species of mammals, one half belong to the sub-class *Aplacentaria*, comprising the *Marsupiata* (kangaroo, wallaby, opossum, wombat, &c.), and two species of the singular order *Monotremata* (Ornithorhynchus and Echidna). Among the marsupial animals peculiar to T., the chief are the Thylacine (*Thylacinus cynocephalus*) and the Tasmanian Devil (*Sarcophilus ursinus*), both of which are sometimes very destructive to sheep in the outlying districts. The skin of the kangaroo is much prized for leather, and there is always a market for opossum fur. Whales and seals, formerly very abundant on the coasts, are now rare; but whaling is still extensively carried on in the adjacent seas. The birds of T. have been admirably described by Gould. The majority are identical with Australian species. The emu is extinct, and black swans are seldom seen in the settled districts. There is abundance of native game, which is now protected by act of parliament during the breeding season. A species of puffin (*Puffinus brevicaudus*), locally known as the mutton-bird, frequents some of the islands in Bass's Strait in countless numbers, and many thousands are annually slaughtered for the sake of their oil, and for food by the half-caste islanders. Fish are plentiful in the seas and rivers, the best being known by the local name of trumpeter, and reaching a weight of 40 lbs. There are 13 species of snakes, most of which are venomous, but accidents from their bite are of very rare occurrence. Many species of insects and crustaceans have been described by Erichson, Gray, Gunther, and others. A comprehensive and accurate account of the *fauna* of T. is still, however, a desideratum.

Fallow deer, and several of the English game-birds, have long been naturalised, and salmon have been introduced after several unsuccessful attempts.

Climate, Soil, Produce, &c.—The climate of T. is fine and salubrious. From observations taken at Hobart Town, and extending over a period of twenty years, the extreme of heat appears to be 105°, and of cold 29° 8′. The mean temperature of the hottest month (January) is 63° 57′, and of the coldest (July), 45° 82′, and of the whole year, 54° 92′. In some parts of the island, the temperature, even in winter, rarely sinks to 45°. Snow seldom falls in the settled districts, and does not lie on the ground except on the high table-lands of the interior. The average annual rain-fall at Hobart Town is 21·52 inches, and the average for the rest of the island about 35 inches, except in the western country and the high lands, where a fall of 75 inches has been registered in the year.

The agricultural lands may be divided into three classes—alluvial deposits, tertiary clays, and loamy soils, derived from the decomposition of different kinds of basalt. In their virgin state, some are marvellously productive. On new land, 100 bushels of oats, 70 bushels of wheat, and 15 tons of potatoes per acre, are not uncommon crops. The fertility of the soil has encouraged a system of slovenly farming. In many instances, the land has been cropped with wheat and oats for upwards of thirty years without any application of manure, or any rest save an occasional summer fallow. The export trade in the staple articles of produce has much fallen off of late years, partly because the neighbouring colonies have

begun to depend more upon their own resources, but partly also through the deterioration of the soil from improvident management, and the necessarily increased cost of production. There are skilled and careful farmers in every district, but they are exceptions to the rule. The open pastoral lands are admirably adapted for sheep. The wool from some of the larger establishments is much valued, and brings the highest price in the London market. The cattle and agricultural horses of some of the northern districts are unsurpassed in the colonies. Pastoral and agricultural associations have been formed to promote improvements in the system of farming, and to encourage the breeding and importation of pure stock. The extent of purchased lands was, in 1865, 3,413,810 acres, of which 340,457 acres were under cultivation. In 1871 the number of horses in the colony was 23,054; of cattle 101,540; and of sheep 1,305,489. For the same year the exports amounted to £740,638, the chief staple article being wool, in value £298,160; the imports were £778,087. In 1870—1871 the yield of wheat was 328,130 bushels; barley, 161,729; oats, 691,250; tobacco, 250,-047 lbs.; apples, 147,614 bushels; pears, 27,553 bushels.

Administration.—Since the passing of the 'Constitutional Act' in 1854, the governing authority has been vested in a parliament, consisting of the governor as the Queen's representative, and two elective Houses, the Legislative Council of 15, and the Assembly of 30 members. The qualification of voters is, for the former, a freehold of the annual value of £50; and for the latter a freehold valued at £100, or a £10 rental. Graduates of British universities, and members of the learned professions, are entitled, *ex officio*, to vote at the election of members of both Houses. One-third of the members of the Council retire every three years; those of the Assembly hold office for five years, except in the case of a dissolution by the governor. The revenue for the year 1871 was £269,715, of which a fourth was derived from the rental and sale of crown-lands. The upset price of land is £1 per acre, payable by instalments extending over eight years; but lots which remain unsold after being offered for sale by public auction, may be purchased, under certain restrictions, at greatly reduced rates. In the unsettled districts, large tracts of land are obtainable at nominal prices. In 1862, an act, known as 'Torrens's Real Property Act,' was passed to facilitate the transfer and conveyance of land. Property which has been brought under the operation of this act can be conveyed, without reference to value, upon payment of 10*s.* registration-fee, £1 for new certificate of title, and 2*s.* for forms. Mortgages can be effected on equally moderate terms. The total value of the land which had been dealt with under this act, up to 31st October 1864, was £230,000.

Religion and Education.—By the Constitutional Act, £15,000 is annually reserved for the support of religion, and is at present divided among the various religious denominations according to their respective numbers at the census of 1871. These were as follows: Episcopalians, 53·41 per cent.; Roman Catholics, 22·24; Church of Scotland, 6·69; Free Church of Scotland, 2·43; Independents, 3·96; Wesleyan Methodists, 7·23; and other sects, 3·03 per cent. The state grants are largely supplemented by endowments and by local contributions. For the support of elementary education, £12,000 a year is appropriated by parliament, the disbursement of which is intrusted to a Central Board, holding its sittings in Hobart Town. The system is based upon the principles established by the Irish National Board. The teachers are appointed by the Board, and are under the supervision of the inspector of schools. The following shews the progress which has been made since 1854. In 1854: Number of schools, 50; average number on rolls, 2734; average attendance, 2624; government aid, £6914; school fees, £882. In 1864: Number of schools, 97; average number on rolls, 4987; average attendance, 3763; government aid, £11,324; school fees, £3933.

For the promotion of higher education, provision is also made by the legislature. Two scholarships, each of the value of £200 a year, and tenable for four years at either of the English universities, are annually open to competition under the direction of the Council of Education, and exhibitions to the higher schools, with other local honours, are periodically awarded by the same body.

Aborigines.—The number of the aborigines at the first colonisation of T. has been variously estimated, but probably at no time exceeded 3000. There were several tribes occupying distinct parts of the island, and differing from each other in dialect and customs; but of a generally uniform type more nearly allied to the Negritos of New Guinea than to the aborigines of Australia. The average height of the men was from 4½ to 5½ feet; of the women, considerably less. Colour, a bluish black; the facial angle 75° to 80°; eyes, dark brown, with jet-black pupils; hair, sometimes lank, but generally crisp or woolly; forehead, high and narrow; limbs, lean and muscular; feet, flat, and turned inwards. Polygamy appears to have been tolerated: the women performed all menial duties, and were specially charged with that of carrying fire from place to place, when the temporary encampment was broken up. Their usual shelter was a 'break-wind,' constructed of boughs, but traces of rude huts have been observed. In summer, they went entirely naked, at other times wearing coverings made from the skins of the kangaroo and opossum, which formed their chief food. The coast tribes, at certain times of the year, lived almost exclusively on shell-fish, and the remains of their feasts have often been mistaken for recent marine deposits. Among other articles of food were the roots of the esculent fern, the heart of the tree-fern, and grass-tree (*Xanthorrhœa*), the seeds of the boobialla (*Acacia sophora*), and a singular fungus (*Mylitta Australis*), commonly known as 'native bread,' which grows under ground near the roots of decayed trees. No traces of cannibalism were observed. Their only weapons were the spear and waddy, a wooden club about 2 feet 4 inches in length. The early relations between the settlers and aborigines were friendly; but as the latter were gradually dispossessed of their favourite hunting-grounds, they became inveterately hostile. Shot down without mercy by the settlers, they revenged themselves by bloody reprisals, and for many years the unequal struggle continued, until their numbers were reduced to a few hundreds. In 1830, an attempt was made to drive the whole body into Tasman's Peninsula, by means of a cordon extending across the whole island, and gradually closing in towards the south-east; but it failed ridiculously, as might have been foreseen. In the following year, Robinson, a builder of Hobart Town, undertook to conciliate the surviving remnants of the various tribes, with a view to their removal to Flinders Island, and this he successfully accomplished, after four or five years of patient, self-denying labour. In spite of all the care bestowed upon these unfortunate people, their numbers rapidly decreased, and only 45 remained when the settlement was removed, in 1847, to a more convenient station, at Oyster Cove, near Hobart Town. In 1865 there were only six remaining. No children have been born among them for many years, and the race is now

wholly extinct, the last of the number having died a few years ago.

History.—The island was first discovered by Tasman on the 1st December 1642, and named by him Van Diemen's Land, in honour of his patron, the then governor of the Dutch possessions in the East Indies. During the next century, no visit is recorded; but between 1772 and 1802, partial surveys and explorations were made by English and French navigators. In 1803, Lieutenant Bowen was despatched from Sydney with a few soldiers and convicts to form a settlement in the south of T., which was finally fixed on the spot where Hobart Town now stands. In 1804, a settlement was formed near the mouth of the Tamar, which was removed in 1806 to the spot now occupied by the town of Launceston. From 1817, commenced a rapid increase in the number of free settlers, who received grants of land in proportion to the capital which they brought into the colony, and were subsequently further aided in the clearing and cultivation of their estates by the assignment of convicts as their servants. In 1825, T. was declared independent of New South Wales.

The colony was for a good many years agitated by the question of the disposal and management of the convicts, who were now becoming a prominent and formidable element in the community. At last, in 1853, transportation to T. and New South Wales was finally abandoned by the home government. The abolition of transportation, and the consequent cessation of a vast imperial expenditure, naturally produced a considerable depression in all branches of trade, especially in the southern districts. It is not surprising that the great body of the colonists, instead of setting themselves manfully to turn the true and natural resources of the country to the best account, have rather looked for some great discovery of rich gold-fields, or some gigantic works undertaken under the auspices of government, as the only means by which the prosperity of the colony was to be assured. But such a state of things must ultimately work its own cure. Viewed in a true light, the progress, social, material, and political, has presented a more hopeful aspect since the extinction of the convict system than at any earlier period. For years after the discovery of gold in Australia, the *expirees* of T. flocked in crowds to the neighbouring colonies, attracted by the prospect of richer gains, and glad to escape from police surveillance in a country where their antecedents were too well known. Those who remained had, for the most part, by this time become orderly, well-conducted members of the community, not to be distinguished from the immigrant population by whom they were surrounded. Necessity will in due time develop the enterprise and energy which have too long lain dormant. Some of the older settlements may prove inadequate to the maintenance of their former population, but the rich lands of the north coast offer to industrious settlers a field which is practically inexhaustible.

TASMA'NNIA, a genus of shrubs of the natural order *Magnoliaceæ*. *T. aromatica* is an evergreen bush of Van Diemen's Land, growing in the richest soils on the margins of rivers and in shady ravines, and sometimes forming thickets of large extent. Every part of the plant is highly aromatic and pungent. The fruit is occasionally used as pepper. This shrub requires protection from frost in England.

TASSISUDO'N, the capital of Bhotan (q. v.), stands on the right bank of the Godadda, an affluent of the Brahmaputra, in lat. 27° 30′ N. Many of the inhabitants, the number of whom has not been ascertained, are employed in manufacturing paper, and in making brass images and ornaments for their places of worship.

TASSO, Bernardo, an Italian poet of considerable distinction, but most famous as the father of the illustrious Torquato, was born at Bergamo, 11th November 1493. Both by his father's and mother's side, he was connected with the ancient family of the Tassi, known in the 13th c. for having organised and superintended the postal service in Italy, Spain, and Germany. His uncle, Luigi Alessandro, Bishop of Recanati, took charge of his education, and under his care he turned out a fine classical scholar, his love of poetry at the same time becoming every year more ardent. The assassination of the cardinal, in 1520, deprived him at once of protection and support, and for several years he wandered about Italy in a rather necessitous condition. Like his son, he was exceedingly fond of the patronage of noble lords and the smiles of noble ladies. After 1525, we find him high in favour with persons of influence. Guido Rangone, general of the pontifical forces, intrusted him with several missions, among others to the Prince of Salerno, who appointed him his secretary; and T. accompanied the prince on the expedition against Tunis in 1534. In 1539, he married, at Salerno, a young lady of Sorrento, Porzia de' Rossi, who added genuine merit to the advantages of birth, beauty, and fortune, and by whom he became the father of Torquato. The fall of the Prince of Salerno (who had incurred the enmity of Charles V.) brought with it the ruin of T.'s worldly prosperity, and he was obliged to seek for a new patron. He was not long in finding friends. Guidubaldo, Duke of Urbino, and Gugielmo, Duke of Mantua, strove for the honour of attaching the poet to their court. The latter succeeded, and named him governor of the city of Ostiglia, where he died 4th September 1569.

T.'s principal writings, chronologically arranged, are: *Rime* (Ven. 1531); *I tre Libri degli Amori* (Ven. 1537); *Ode e Salmi* (Ven. 1560); *L'Amadigi, Poema* (Ven. 1560); and *Il Floridante, Poema* (Mant. 1587). Of these, the principal is *L'Amadigi* (Amadis), which some Italian critics have not hesitated to place above the poem of Ariosto; but without adopting this extravagant estimate, we may justly admire it for the sweetness and elegance of its language, and for the beauty of its descriptions and comparisons.—For a good idea of the politics and literature of the time, see Seghezzi's edition of his *Lettere* (3 vols., Padua, 1733—1751), to which there is prefixed a biographical notice.

TASSO, Torquato, one of the greatest poets of Italy, was the son of the preceding, and was born at Sorrento in Naples, 11th March 1544. His earliest education was received from the Jesuits. During his childhood, T.'s father was an exile, but the affectionate solicitude of his mother well supplied the want of paternal care. In 1554, he went to Rome to join his father, and left his mother (whom he was destined never again to see) in a convent at Naples. At Rome, and subsequently at Bergamo, Urbino, Pesaro, and Venice, he continued to prosecute his studies. He assisted his father in copying, correcting, and even in completing his poem *L'Amadigi*, though as yet only 16 years of age. No wonder old Bernardo was delighted at the promise shewn by his son, and prophesied in his letters that Torquato would yet become a great man. Later, however, sad experience of the miseries of a poet's life, induced him to send T. to Padua, to study jurisprudence under the celebrated Panciroli. But whom the gods have made poetical can never sink into a lawyer. The youth remained at Padua a year, and wrote *Rinaldo* (Venice, 1562), a poem in 12 cantos,

the hero of which is the son of Aymon, and cousin of Roland. It belongs, therefore, to the class of heroic romances. After the first burst of anger was over, Bernardo forgave his son for following his example rather than his precept, and became prouder of T.'s genius than ever. T. now betook himself to the university of Bologna, to study philosophy, and is said to have distinguished himself by an extraordinary facility in the discussion of the most elevated and abstract themes—a circumstance that perhaps says more for his power of rhetoric than his power of speculation. On leaving Bologna, he spent some time with friends at Castelvetre, Modena, and Corregio, but returned to Padua at the request of his friend Scipio de Gonzaga, afterwards cardinal, who had established a literary academy there, of which T. became a member. It was during this second residence at Padua that he conceived the first idea of his great work, the *Gerusalemme Liberata*, a heroic record of the conquest of Jerusalem by the Crusaders under the command of Godfrey de Bouillon. Lamartine beautifully describes the mingled motives of the poet: 'Urged by piety no less than by the muse, Tasso dreamed of a crusade of poetic genius, aspiring to equal by the glory and the sanctity of his songs, the crusades of the lance he was about to celebrate.' The same critic goes on to observe, in allusion to the less noble passion for the applause of courts that marked the poet: 'The names of all the noble and sovereign families of the West would be revived in this epic catalogue of their exploits, and would attract to the author the recognition and favour of the great. . . . . Finally, the poet was himself a knight, noble blood flowed in his veins, to celebrate warlike deeds seemed, as it were, to be associating his name with those of the heroes who had performed them on the field of battle: thus religion, chivalry, poetry, the glory of heaven and earth, the hope of eternal fame, all combined to urge him to the undertaking.' Bernardo heard of his son's design with exulting joy, and blessed Heaven for making Torquato a greater genius than himself. Meanwhile (1565), T. had been introduced by Cardinal Luigi d'Este (to whom he had dedicated the *Rinaldo*) to his brother, Alfonso II., sovereign Duke of Ferrara. Here for a time he was supremely happy. Young, handsome, courteous, and with that proper tinge of melancholy in his disposition that possesses an irresistible charm for women, he soon became a universal favourite with the beauties of the court. While their bright eyes rained influence, T. painted his *Armida* and *Herminia* almost without effort. It is only just to add, that the attempt to seek the origin of his subsequent miseries and madness in a presumptuous passion for Leonora, sister of the Duke of Este, which was first encouraged, then repulsed, and finally punished with imprisonment, is utterly at variance with the notorious facts of the case. Space does not permit us to examine the question here, but it appears necessary to correct so radical an error, sanctioned as it is by the illustrious name of Goethe. T. courted, platonically and otherwise, various ladies of the court—a pretty chamber-maid even was not beneath his notice; but there is not a vestige of evidence to shew that he lifted his eyes to the sister of his sovereign, or that such a suspicion was ever harboured by the lady herself or her brother. In truth, his madness was connected in its origin more closely with his poetry than with his loves. Having finished his great epic about 1575, he sent a copy of it to a society of scholars, critics, and churchmen at Rome, to get their opinion of it. It would have been far better had he published the poem at once, without placing it at the mercy of critics who were delighted to have the opportunity of finding fault before the public was in a position to praise. The critics would then have been forced to swell the chorus of general admiration. T. was tortured by their waspish comments, and, with pitiable agonies, proceeded to make his work more agreeable to his incapable judges. Gradually a morbid melancholy overpowered his reason; the spites and jealousies that are never absent from a gay and pleasure-loving court, contributed to increase his mental disorder. He believed that invisible persecutors had denounced him to the Inquisition as a heretic. It was in vain that Alfonso and his sisters tried to calm the perturbations of his spirit, and even got the Inquisition to write him a reassuring epistle. His paroxysms increased in violence. Finally, one evening (17th June 1577), he drew his dagger in the apartments of the Duchess of Urbino, to stab a domestic whom he conceived to be one of his secret enemies; whereupon Alfonso had him conveyed to a prison-hospital for the benefit of his health, rather than to punish him. On the 20th of July, he made his escape, and fled across the Abruzzi to his birthplace, Sorrento, where he took refuge with his sister. The air of his native place quickly restored him to health; but no sooner had he recovered, than he began to yearn for the old excitements, begged Alfonso to take him back, and when that prince drily informed him that he might return if he pleased, T. greedily availed himself of the cold permission, and was soon as wretched as before. A new flight ensued, this time towards the north of Italy. The unhappy poet wandered at last half-naked into the city of Turin, where he was humanely received by the Marquis d'Este, brother of Alfonso. After some time, he again ventured to return to Ferrara (21st February 1579), but only to madden, almost as soon as he breathed its noxious air. Alfonso was again obliged to put him under constraint, in which he remained upwards of seven years, when the duke, at the request of several of his brother sovereigns, released him (5th July 1586). During the remainder of his life, T. lived chiefly at Naples. Almost the last incident of his career, was his visit to Rome to receive (like Petrarch) the honour of a public coronation on the Capitol. The excitement was too much for his ruined frame. A slow fever seized him; he was removed to the convent of Santo Onofrio, on the Janiculum, and there died, 25th April 1595, after a brief illness.—See Manso, *Vita di T. Tasso* (Nap. 1619); Jacobi, *Vindiciæ T. Tasse* (Gött. 1763); Serassi, *Vita del Tasso* (Rome, 1785); Black, *Life of T. Tasso* (Edinb. 1810); Ebert, *T. Tasso's Leben* (Leip. 1819); Zuccala, *Della Vita di Tasso* (Mil. 1819); Milman, *Life of T. Tasso* (Lond. 1850); Cibrario, *Degli Amori e della Prigione di Tasso* (Tur. 1862).

Besides his *Gerusalemme Liberata*, T. wrote a great number of works in verse and prose, among which may be mentioned *Rime, insiemi con altri Componimenti* (Ven. 1581); *Dialoghi e Discorsi* (Ven. 1586—1587); *Lettere Familiari* (Bergamo, 1588); *Rime* (Brescia, 1592—1593); and *Gerusalemme Conquistata* (Rome, 1593). The most complete edition of his works appeared at Pisa, 1821—1832, in 33 vols.

TASTE, Organ and Sense of. The principal seat of the sense of taste is the mucous membrane of the tongue, in which dissection reveals a *cutis* or *chorion*, a *papillary structure*, and an *epithelium*. Of the *cutis*, it is sufficient to remark that it is tough, but thinner and less dense than in most parts of the cutaneous surface, and that it receives the insertions of the intrinsic muscles of the tongue, which will be described when we treat of that organ generally. The *papillary structure* differs from that of the skin in not being concealed under the epithelium, but in projecting from the surface like the villi of the digestive canal, and it thus gives to the tongue its

well-known roughness. The *Epithelium* (q. v.) is of the scaly variety, as on the skin, but is much thinner on the tongue than on the skin. It is most dense about the middle of the upper surface of the tongue, and it is here that, in disordered digestion, there is the chief accumulation of *fur*, which in reality is simply a depraved and over-abundant formation of epithelium. The *papillæ* on the surface of the tongue are either *simple* or *compound*. The former, which closely resemble those on the skin, are scattered over the whole surface of the tongue in parts where the others do not exist, and they likewise participate in the formation of the compound papillæ, which, from their forms, are respectively termed (1) the *circumvallate* or *calyciform*, (2) the *fungiform*, and (3) the *conical* or *filiform*.

The *circumvallate* papillæ are not more than eight or ten in number, and are situated in the form of a V at the base of the tongue. Their function seems to be to secrete mucus, as well as to take part in the act of tasting. They consist of 'a central flattened projection of the mucous membrane of a circular figure, and from $\frac{1}{20}$th to $\frac{1}{12}$th of an inch wide, surrounded by a tumid ring of about the same elevation.'—Todd and Bowman, *Physiological Anatomy and Physiology of Man*, 2d ed. vol. i. p. 437. They are shewn in the figure of the surface of the tongue given in the article on that organ.

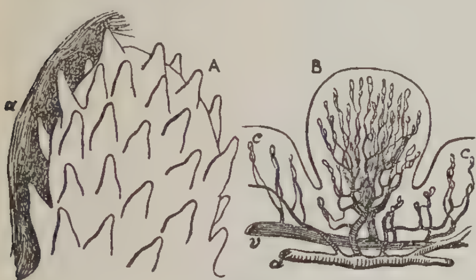


Fig. 1.

A, *Fungiform papilla*, shewing the simple papillæ on its surface; and at *a*, the epithelium investing them (magnified 35 diameters). B, a similar papilla, with the capillary loop of its simple papillæ injected; *a*, artery; *v*, vein. Around the base there is often a groove, which is here shewn; as also are the capillary loops, *c*, *c*, of two of the neighbouring simple papillæ (magnified 18 diameters).

The *fungiform* papillæ are scattered over the surface in front of the circumvallate papillæ, and about the sides and apex. They are usually narrower at the base than at the apex, where they are about $\frac{1}{30}$th of an inch in diameter. They are covered with simple or secondary papillæ, and

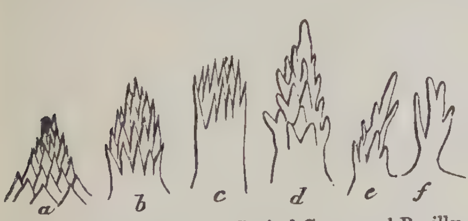


Fig. 2.—Various Forms of Conical Compound Papillæ.

a, *b*, *c*, provided with the stiffest and longest epithelium, and the simple papillæ much acuminated; *d* approximates to the fungiform, and *e* and *f* to the simple papillæ. (Magnified 20 diameters.)

their investing epithelium is so thin that the blood circulating in them gives them a red colour, which is not seen in the conical papillæ amongst which they are distributed. They contain nerves terminating in loops. The shape of the *conical* or *filiform* papillæ is indicated by their names; and even if they take little part in the sense of taste directly it is convenient to describe them here. Their average length is about $\frac{1}{10}$th of an inch. The structure of these papillæ will be better understood from the accompanying diagrams than from any verbal description. They terminate in long pointed processes, which are bathed by the mucus of the mouth, and are capable of moving in any direction, although they are generally inclined backwards. Some of the stiffer of these epithelial processes enclose minute hairs, of which several forms are depicted by Messrs Todd and Bowman, from whose *Physiological Anatomy* all the figures in this article are borrowed. These authors surmise, on structural grounds, that the filiform papillæ 'can scarcely share in the reception of impressions which

Fig. 3.

A, vertical section near the middle of the dorsal surface of the tongue, shewing the basement membrane on which lie *a*, *a*, fungiform papillæ; *b*, *b*, filiform papillæ, with hair-like processes; *c*, *c*, similar papillæ devoid of these processes. B, a filiform compound papilla, magnified 300 diameters: *a*, artery; *v*, vein; *c*, capillary loop; *d*, a secondary papilla deprived of *e*, epithelium; *f*, hair-like processes at the apex.

depend on the contact of the sapid material with the papillary tissue. The comparative thickness of their protective covering, the stiffness and brush-like arrangement of their filamentary productions, their greater development in that portion of the dorsum of the tongue which is chiefly employed in the movements of mastication, all evince the subservience of these papillæ to the latter function rather than to that of taste; and it is evident that their isolation and partial mobility on one another must render the delicate touch with which they are endowed more available in directing the muscular actions of the organ. The almost manual dexterity of the tongue in dealing with minute particles of

food is probably provided for, as far as sensibility conduces to it, in the structure and arrangement of these papillæ.'—*Phys. Anat. and Phys. of Man*, vol. i. p. 441. Notwithstanding the difference in their outward form and mode of arrangement, the simple papillæ, which have been detected by Todd and Bowman as scattered over the whole dorsum of the tongue (although concealed under the common sheet of epithelium), and those clothing the circumvallate and fungiform papillæ, do not seem to present any structural difference; and their epithelium, which is very thin, readily permits the transudation of sapid substances dissolved in the mucus of the mouth. With regard to the use of the singular configuration of the circumvallate and fungiform papillæ, 'it may be conjectured that the fissures and recesses about their bases are designed to arrest on their passage small portions of the fluids in which the sapid materials are dissolved, and thus to detain them in contact with the most sensitive parts of the gustatory membrane.'—*Op. cit.*, p. 441.

There has been much discussion regarding the precise seat of the sense of taste and the true nerves of taste. Although the surface of the tongue is the special seat of gustative sensibility in man, the sense of taste is by no means restricted to that organ, being diffused, in a less degree, over the soft palate, the arches of the palate, and the fauces. Moreover, the gustative sensibility varies on different parts of the surface of the tongue. It is generally allowed that acute taste 'resides at the base of the tongue, over a region of which the circumvallate papillæ may be taken as the centre, and also on the sides near the base. These parts are supplied solely by the glossal twigs of the glosso-pharyngeal nerves. Some writers, amongst whom are Valentin and Wagner, believe the middle and anterior parts of the dorsum of the tongue to be usually incapable of appreciating flavour; while numerous others hold the contrary opinion, with which our own careful and repeated experiments, on other persons as well as ourselves, quite accord. Sour, sweet, and bitter substances applied to the sides, and especially to the tip of the protruded tongue, we find to be at once distinguished; though, when placed on the middle of the dorsal region, they make little or no impression till pressed against the roof of the mouth. This region of the tongue is supplied almost solely by the lingual branch of the fifth nerve. We conclude generally, with regard to the tongue, that the whole dorsal surface possesses taste, but especially the circumferential parts, viz., the base, sides, and apex.'—*Op. cit.*, pp. 442, 443. The investigations of Messrs Todd and Bowman further shew that the soft palate and its arches are endowed with taste in some persons, but not universally, while they got no evidence in any case of gustative sensibility on the pharynx, gums, or elsewhere. The soft palate and its arches are supplied by palatine branches from Meckel's ganglion, and sparingly by the glosso-pharyngeal nerves. From (1) the evidence afforded by the anatomical distribution of the nerves to parts enjoying the sense of taste, (2) the evidence of experiments, in which the various nerves of the tongue were divided, and (3) the evidence afforded by disease, it may be safely inferred that the glosso-pharyngeal and the lingual branches of the fifth pair of nerves respectively participate in the sense of taste; and there is also reason to attribute a share to the palatine branches of the fifth.

Impressions of taste may be produced by a mechanical or chemical excitement of the gustatory nerves. A quick light tap of the finger on the tip of the tongue causes a taste, sometimes acid, sometimes saline, which lasts for several seconds; and galvanism acts similarly. If the surface of the tongue, near the root, be touched with a clean dry glass rod, or a drop of distilled water be placed upon it, a slightly bitterish sensation is produced; and if the pressure be continued, a feeling of nausea ensues. If a small current of cold air be directed against the tongue, it excites a cool saline taste like that of saltpetre. From the experiments of E. H. Weber, it appears that one of the conditions requisite for the due exercise of the sense of taste is a temperature not departing far on either side from the natural standard. Thus, if the tongue be immersed for a minute in water at a temperature of 125°, or in iced water, the taste of sugar, &c., is no longer perceived. In order that sapid bodies should cause taste, it is necessary that they should be dissolved, and made to permeate the tissue of the papillæ, so as to come in contact with their nerves. This is proved by the two following facts: 1st, that every substance, whether solid, fluid, or gaseous, which possesses a distinct taste, is more or less soluble in the fluids of the mouth, while substances which are perfectly insoluble are only recognised by the sense of touch; and 2d, that if the most sapid substance be applied in a dry state to a dried part of the surface of the tongue, no sensation of taste is excited. Bitters and acids appear to be the most sapid bodies, since they may be diluted to a greater extent than any other known substances without ceasing to excite sensations of taste. Thus, according to Valentin, 1 part of extract of aloes, or of sulphuric acid, in 900,000 of water, and even 1 part of sulphate of quinia in 1,000,000 parts of water, may, with ease, be distinguished from perfectly pure water. 'The contact of a sapid substance,' says Dr Carpenter, 'much more readily excites a gustative sensation when it is made to press upon the papillæ, or is moved over them. Thus there are some substances whose taste is not perceived when they are simply applied to the central part of the dorsum of the tongue, but of whose presence we are at once cognizant by pressing the tongue against the roof of the mouth. The full flavour of a sapid substance, again, is more readily perceived when it is rubbed on any part of the tongue, than when it is simply brought in contact with it, or pressed against it. Even when liquids are received into the mouth, their taste is most completely discriminated by causing them to move over the gustative surface: thus, the 'wine-taster' takes a small quantity of the liquor in his mouth, carries it rapidly over every part of its lining membrane, and then ejects it.'—*Principles of Human Physiology*, 6th ed. p. 621. Most sapid substances affect the nerves of smell to a greater or less degree, as they pass down the throat; and it is this compound of taste and smell that constitutes *flavour*. It is a common habit to hold a child's nose when he is taking a nauseous draught, with the view, as is supposed, of deadening the taste. The efficacy of the process depends upon the exclusion of smell, and the reduction of the flavour of the medicine to its mere taste. The agreeable sensation produced by sipping good wine is due to what is termed its *bouquet*, or, in other words, to its flavour, or combined taste and smell. Some substances leave a taste in the mouth very different from that which they first produced. This *after-taste* is usually bitter; but in the case of one of the most bitter substances known, namely, tannin, it is sweet. This connection seems, in a degree, to correspond to the complementary colours in vision.

There can be no doubt that the sense of taste has for its primary object to direct us in the choice of food, to make the act of eating agreeable, and to excite the flow of mucus and saliva which aid the

digestive process; and amongst the lower animals, the instinctive perceptions connected with this taste are much more remarkable than in man. As a general rule, it is found that those substances whose taste is agreeable are useful articles of food, and *vice versâ;* although there are some well-known exceptional cases. Sir Henry Holland, in his *Medical Notes and Reflections*, observes that in the majority of instances of actual illness, the desires of the patient as to food and drink may be safely complied with, even when some seeming extravagance of diet is suggested; and that in the early stage of recovery from gastric fevers, he has seen many curious instances of such contrariety to all rule acquiesced in with manifest good to the patient. 'Dietetics,' he adds, 'must become a much more exact branch of knowledge, before we can be justified in opposing its maxims to the natural and repeated suggestions of the stomach, in the state either of health or disease.'

TATE, NAHUM, a poet and dramatist, son of the Rev. Dr Faithful Tate, was born in Dublin in 1652, and educated at Trinity College, Dublin. In 1690, he succeeded Shadwell as poet-laureate, and held that dignity till his death in 1715. His habits were somewhat improvident, and in the latter part of his life he resided within the precincts of the Mint at Southwark, then a privileged sanctuary for debtors—hence perhaps that 'down-cast look' and inability to 'say much for himself,' for which, it is said, he was remarkable. His writings include nine or ten dramatic pieces, *Panacea, or a Poem on Tea*, various birthday odes, and an elegy on the death of Queen Mary. He lived to write the first birthday ode for George I. But T. is best known by the metrical version of the Psalms, which he executed in conjunction with Dr Nicholas Brady, chaplain to King William and Queen Mary, which was attached to the Prayer-book, and came into general use in the Church of England, supplanting the older version made in the reign of Edward VI. by Sternhold and Hopkins.

TATIAN, one of the early apologists of Christianity against the pagan philosophers, and the founder of a sect which, whether under his own name, or under various other appellations derived from its peculiar tenets or practices, attracted considerable notice in the primitive ages. T. was born in Syria or Assyria about the year 130. Having cultivated rhetoric and philosophy in various places, he came to Rome about 162, where he became the disciple and friend of Justin the Martyr, and was by him converted to Christianity. He is known to have written many works—*infinita volumina*, says Jerome—of which, however, only one is preserved, the Apology already referred to. The date of its composition is uncertain, but it seems probable that it was written before the death of Justin (166 A.D.). No trace appears in the Apology of the heterodox opinions of T., and it is alleged by Tertullian (*Adv. Hær.* i. 28, 1) that it was not till after the death of Justin that he fell into the errors to which he has given a name. He then removed to the East, and is said to have established himself in Mesopotamia. Without entering into the details of T.'s peculiar opinions, it will be enough to say that, especially in their moral aspect, they form the foundation of one of the great divisions of Gnosticism (q. v.). Starting from the common principle of dualism, and of the origin of matter from the evil principle, and its consequent evil nature, T., unlike the Egyptian Gnostics, held the necessity of overcoming the corrupt nature of man, and purifying it by abstinence and ascetic rigour. Accordingly, he reprobated marriage, and condemned all sensual indulgence. One of his 'opinions,' affirming the damnation of Adam, was peculiarly odious to the orthodox party. He condemned the use of wine so strongly as to forbid it even in the celebration of the Eucharist, in which his followers permitted only water to be used, whence they received the name of *Hydroparastatai* (from *hydor*, water, and *paristemi*, I present), and Latin *Aquarii*. From their generally rigorous asceticism, they were called *Encratites* (from *engkratein*, to keep continent). In their dogmatic views as to Docetism, the Demiurge, and Emanations, they differed little from other Gnostics of the Syrian school. See GNOSTICS, MANICHÆANS, MYSTICISM.

TATIUS, ACHILLES, one of the later Alexandrine authors, of whose life absolutely nothing is known. He was formerly thought to have flourished during the 2d or 3d c. A. D.; but as he undoubtedly imitated the style of Heliodorus of Emesa, he cannot be placed earlier than the beginning of the 6th c. (see NOVELS). Suidas, who calls him Achilles Statius, says that he was originally a pagan, but that he was afterwards converted to Christianity, and rose to be a bishop. If this be true, the romance which has preserved the author's name, *Ta Kata Leukippen kai Kleitophōnta* (The Loves of Leucippe and Cleitophon), must have been composed before his conversion, for it is in parts too licentious and too heathenish to be the work of a Christian, and more especially of a convert. The first edition of the Greek original appeared at Heidelberg in 1601; another, with a copious commentary, was published by Salmasius in 1640; but the best is that by Fr. Jakobs (Leip. 2 vols., 1821).

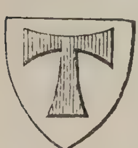
TA'TTA (more correctly, THATTA), a town of Sinde, on the right bank of the Indus, and at the head of the delta of that river, 64 miles east of Kurrachi. In former times, T. was a most flourishing town, and manufactured fabrics of silk and cotton—a branch of industry that has almost wholly disappeared. The only noticeable structure is the mosque of Shah-Jehan, built of brick, which is now falling into decay; but the vast cemetery of T. deserves mention. It has an area of 6 sq. m., contains, it is calculated, at least a million tombs, and has room for not less than four millions. Pop. of T. about 10,000.

TATTOO, in Military life, is the beat of drum and bugle-call sounded at sunset to draw in all stragglers and others on detached duty.

TATTOO'ING, a custom extensively prevalent among savage nations, of marking the skin with figures of various kinds, by means of slight incisions or punctures and a colouring matter. The term is of Polynesian origin, and is said to be derived from a verb *ta*, which signifies to strike. Tattooing is almost universal in the South Sea Islands, except where Christianity and civilisation have put an end to it. New Zealanders' heads, exhibiting tattooing, are amongst the curiosities to be seen in museums; and at one time it was very common for the masters of vessels visiting New Zealand to purchase them and bring

New Zealand Chief's face tattooed.
(From a Photograph.)

them home, although there is too much reason to believe that the price paid for them stimulated the feuds of the natives. The tattooing of the New Zealanders and other South Sea Islanders often covers the whole face, and sometimes also the chest, arms, and other parts of the body with elaborate patterns. It is performed in youth, and marks the transition from boyhood to manhood, like the assumption of the *toga virilis* among the ancient Romans. The operation is accompanied with superstitious ceremonies, and is attended with considerable pain, which, of course, is to be endured with manly indifference. An instrument of bone, toothed on the edge, is employed, which is applied to the skin, and struck with a piece of wood, having first been dipped in a thick mixture made by rubbing down charcoal with a little water. The marks which result are permanent, and appear black on a brown skin; although they are dark blue on the skin of a European. Tattooing is, or has been, practised in almost all parts of the world. It seems to be one of the practices prohibited to the Jews, in Lev. xix. 28, 'Ye shall not make any cuttings in your flesh for the dead, *nor print any marks upon you*,' from which may be inferred its prevalence among the surrounding tribes in the days of Moses, and its connection with their superstitions. The Bedouin Arabs, the Tunguses, and other eastern tribes, and many tribes of American Indians, practise it at the present day. Among the Bedouins, it is a favourite mode of female adornment. It prevailed among the ancient Thracians, and was distinctive of high rank. The ancient Britons also practised it, and traces of it appear to have lingered in England till after the Norman Conquest. Perhaps the practice of sailors to print anchors and other marks on their arms, may be regarded as a relic of it still subsisting.



Tau.

TAU, Cross, in Heraldry, a cross of a form somewhat resembling the Greek letter *Tau*. St Anthony is generally represented with a cross of this description, embroidered on the left side of his garment.

TAUCHNITZ, Karl Christoph Traug., a famous German printer and bookseller, was born at Grosspardau, near Leipzig, in 1761. Bred a printer, he began, in 1796, a small printing business of his own in Leipzig, with which he shortly after conjoined publishing and typefounding, and which, in process of time, became one of the greatest establishments of the kind in Germany. In 1809, he began the issue of a series of editions of the classic authors, the elegance and cheapness of which gave them a European circulation. By offering a prize of a ducat for every error pointed out, he was able to bring out, in 1828, an edition of Homer of extraordinary correctness. He was the first to introduce (1816) stereotyping into Germany; and he also applied it to music, which had not been attempted before. In the latter years of his busy life, he stereotyped the Hebrew Bible, and the Koran in the original Arabic. On his death, in 1836, the business was continued by his son, Karl Christian Phil. Tauchnitz.—A nephew of the elder T., Christian Bernh. Tauchnitz, also set up a publishing establishment in Leipzig, combined with printing. Among the most noted of his undertakings is the issue of 'British Authors' (begun 1842), so well known to all English travellers on the continent, of which upwards of 1000 vols. have appeared.

TAULER, John, a remarkable mystic and preacher, was born at Strasburg in 1290, and died there 16th June 1361. About the year 1308, renouncing a considerable fortune, he entered into the mendicant order of Dominicans, and afterwards studied theology in Paris, shewing at that early period a predilection for speculative and mystic writings, as the scholastic philosophy and the prevailing theology of the schools did not satisfy him. Notwithstanding this tendency, his predominating practical turn of mind led him, on his return to Strasburg, to preaching and pastoral duty; and this he continued to practise with zeal and undaunted courage, even when, in consequence of the excommunication which the pope had hurled against the Emperor Ludwig, the country had fallen into a state of dreadful distraction, and almost all the clergy, in obedience to the interdict issued by the Bishop of Strasburg, had suspended worship. Although T. was now 50 years old, and had enjoyed celebrity for several years as a preacher, so powerfully was he influenced by a Waldensian of the name of Nicholas von Basel, who paid him a visit in 1340, that he gave himself up for two years to ascetic exercises and devout contemplation. Afterwards, however, he betook himself more decidedly to vigorous exertions on behalf of the despised and oppressed people, and preached with wonderful power, inveighing against the avarice, ostentation, and hard-heartedness of the laity as well as of the clergy; and, although not departing from the doctrines of the church, yet fearlessly exposing its abuses, and even not sparing the pope. Thus it happened, that although he had indefatigably administered the consolations of religion in the midst of the horrors and desolation of the Black Death (q. v.), the bishop interdicted him from preaching, and he was obliged to quit his native town. He repaired to Cologne; but nothing further is known, either of his residence there or of his return to Strasburg, where, after a life full of toil, denial of self, and beneficence to others, he died, an old man of 70 years, and was buried in his cloister. If not the greatest German preacher of the middle ages as a whole, T. certainly was the greatest of his times. As his mysticism was in noways passive, but aimed at rising above the sad condition of his times and the failings of the church by inward piety and a love self-denying but at the same time active; so his style, both in his preaching and in his devotional works, was lively, impressive, picturesque, and had altogether a practical direction. Among his devotional works, the *Nachfolge des armen Lebens Christi* holds the first place. Whether the sacred hymns which bear his name really belong to him, is doubtful. Of his writings and sermons, in which he always used the German language, many have been preserved in MS.; and since 1498, numerous editions have been published, but untrustworthy, and often translated into the dialect of the place where they happened to be printed. A careful translation into new High-German has been published by Schlosser (*Predigten*, 3 vols. Frank. 1826; *Nachfolgung des armen Lebens Christi* (Frank. 1833); Schmidt, *Johannes Tauler von Strasburg* (Hamb. 1841); and Susannah Winkworth, *Life and Times of Tauler*, with 25 of his sermons translated from the German (Lond. and New York, 1857).

TAUNTON (*Tone-ton*), so named from being built on the banks of the river Tone, is situated in the extensive and beautiful valley of Taunton Dean, or Vale of Taunton, in the county of Somerset, 37 miles south-west of Bristol by railway. It communicates by railway with the Bristol and English channels. The streets are wide, well-paved, and lighted; the shops are modern and capacious,

There are places of worship connected with the Established Church, 4; Baptists, 1; Independents, 2: Wesleyans, 2; Friends, 1; Plymouth Brethren, 1; Unitarians, 1; Roman Catholics, 1. T. has an Archæological and Natural History Society, in connection with which there is an extensive museum—rich especially in fossils from the Devonian strata, and the bones of mammalia of the cave period from Mendip and the Somersetshire gravels—and a well-conducted reading-room. There is a collegiate school founded by Bishop Fox, 1522, and several other good schools, and many charitable and other institutions. T., which is a parliamentary borough, returns two members to the House of Commons. Pop. (1881) 16,611. Ina, king of the West Saxons, built a castle in T. about 700 A.D.; here, too, he held a great council, in which was drawn up a code of laws for the government of his realm. Ethelard bestowed the town of T. on the church of Winchester. In 1127, Giffard, Bishop of Winchester, built and endowed a priory here for the canons of St Augustine; and in 1322, we find a house here of Carmelite friars, founded by Walter de Meriet, lord of the manor of Combe Florey. In 1269, a leper-house was founded in that part of the town known as East Reach. To T. Castle, Perkin Warbeck fled when he failed in storming Exeter. During the civil wars between Charles and the parliament, the town was twice besieged by Goring, and twice successfully defended by Colonel Blake. In T., Monmouth received the heartiest welcome, and Judge Jeffreys exercised his unbounded cruelty.

TAUNTON, a flourishing town of Bristol County, Massachusetts, on Taunton River, 35 miles south of Boston, and 30 miles E.N.E. of Providence. The falls of Taunton River and its branches furnish water-power to numerous factories, among which are 6 cotton-mills, 1 for cotton machinery, 2 for locomotives, 6 for machinery, 6 foundries, 2 tacks and brads, copper and zinc, 3 britannia ware, with rolling-mills, a nail and shovel factory, metallic gas pipes, enamelled cloth, screws, files, arms, crucibles, fire-brick, &c. In 1865, 2191 tons of tacks and brads were produced, valued at $530,000; and the copper, yellow metal, and zinc factory employed 1875 tons, valued at $1,694,000, and turned out copper-sheets, bolts, printers' rolls, &c., weighing 3,750,000 lbs. Pop. (1880) 21,213. Three railways pass through it, and it has a considerable coasting-trade by the river, and important fisheries of shad, herrings, and alewives. There are 16 churches, 33 schools, a state hospital for the insane with 400 patients, academy, court-house, 1 daily and 3 weekly newspapers, 3 banks, &c. T. was settled from Taunton in England in 1638. Its first minister was William Hooke, afterwards a chaplain of Cromwell.

TAU'NUS MOUNTAINS. See NASSAU.

TAU'RIDA, a government of South Russia, bounded on the E., S., and S.W. by the Sea of Azov and the Black Sea. Area, 24,140 sq. m.; pop. 606,783, mostly Nogai Tartars. The peninsula of the Crimea (q. v.) forms the southern portion of the government, and is connected with the northern portion by the Isthmus of Perekop (q. v.). The region north of the isthmus is flat; the Crimea contains mountain-ranges which rise upwards of 5000 feet. The only great river is the Dnieper, which forms the north-west boundary; and the other principal streams are the Salgir and Alma in the Crimea. Among the salt lakes of the Crimea, which are very productive in salt, the Lake of Sakky is celebrated for the efficacy of its waters in certain cases of disease. The climate is temperate and warm on the southern shores of the Crimea. The soil is fertile, but cultivation is carried on on a very limited scale. In the north, the pasturage is very rich, and cattle-breeding is the main employment of the inhabitants. In the south, the mountains are clad with forests, the tobacco-plant is successfully cultivated, and fruit-growing and wine-culture are the principal occupations. The Crimean wines, the *bouquet* of which resembles that of Burgundy and the Rhenish wines, are of a very good quality. The native riches of the government, its excellent ports and harbours, promise great commercial progress. Simferopol (q. v.), in the Crimea, is the capital of the government, and Sebastopol and Theodosia are ports of rapidly increasing importance.

TAU'RINE, $C_2H_7NSO_3$, is a very remarkable substance occurring in the bile and in other animal products and tissues. In a state of purity, it forms six-sided glistening prisms, which are perfectly transparent, neutral, devoid of odour, readily soluble in hot water, but difficult of solution in cold water, and insoluble in alcohol and ether. It does not enter into combination either with acids or bases. When heated, it undergoes decomposition, and evolves sulphurous acid, in consequence of the sulphur (upwards of 25 per cent.) which it contains. Taurine occurs naturally in the bile of many animals, including man. As a product of the decomposition of the bile, it may be found in the contents of the intestine and in the excrements; and in cases of jaundice it has been found in the blood, transudations, and urine. Its artificial formation has been noticed in the article SYNTHESIS. Its name is derived from the Latin *taurus*, a bull, because taurine was first discovered in the bile of the ox.

TAU'RUS, MOUNT. See ANATOLIA.

TAUTO'G, or BLACKFISH (*Tautoga nigra* or *Americana*), a fish of the family *Labridæ* (q. v.), of the section forming the family *Cyclo-labridæ* of Müller. It is found in the North American seas, and is in great request for the table. It brings a very high price in the New York market. It attains a size of 12 or 14 lbs. Its colour is black on the back and sides; the belly is whitish; both jaws have a double row of strong conical teeth; the face is covered with a scaleless integument. The T. is caught by hook and line on rocky bottoms. It is sometimes kept in stews to fatten.

TAUTO'LOGY (Gr. *tauto*, the same, and *logia*, speech) is a term used to denote the useless repetition of the same ideas in different words. It is considered one of the worst vices, whether of oral or written style, and certainly none more effectually robs language of its force and impressiveness.

TA'VERN, a place of entertainment for man and beast, is not a legal term. See INN, PUBLIC-HOUSES.

TAVERNIER, JEAN BAPTISTE, BARON D'AUBONNE, a celebrated French traveller, was the son of a Flemish engraver who had settled in Paris, and was born there in 1605. The conversation of the savans who frequented his father's shop inspired him with an ardent curiosity to visit other countries, and prompted him to leave the parental roof before his 15th year. After visiting England, the Low Countries, Germany, Hungary, and Italy, he eagerly caught at the offer made to him by Father Joseph (the confidant of Richelieu), to accompany two French noblemen to the East. This journey lasted from December 1630 to the summer of 1633, the line of route passing through Regensburg, Dresden, Vienna, Constantinople (where he left his masters), Erzeroum, Tabriz, Ispahan, Bagdad, Aleppo, and Scanderoon, and thence by sea to Rome. T. then obtained an important post in the household of the Duke of Orleans, but received occasional leaves of absence to prosecute his journeys in the East. The *second journey* (1638—1643) was from Marseille

to Scanderoon, thence across Syria to Ispahan, South-western Persia, and Hindustan; the *third* (1643—1649), through Ispahan, much of Hindustan, Batavia, and others of the East Indies; and in the *fourth* (1651—1655), *fifth* (1656—?), and *sixth* (1663—1669), various portions of Persia and Hindustan were visited, the outward route being generally by way of Syria and the Arabian Desert, and the return one by Asia Minor. T. invariably travelled as a dealer in precious stones and other valuable articles of small bulk, and the great profits he realised strongly impressed upon him the advantages of regular commerce between Europe and the East. On his return to France in 1669, he was graciously received at court by Louis XIV., who presented him with 'letters of nobility' in reward for his services to French commerce in India. But his prodigal expenditure and careless generosity speedily reduced his fortune, and the revocation of the Edict of Nantes compelled him to take refuge in Switzerland, whence he removed to Berlin, and became director of an East India Company which was projected by the Elector of Brandenburg. With the view of discovering a road to the Indies through Russia, he set out from Berlin in 1688, but died at Moscow in July 1689. An account of his travels was written for him by various parties (for T. had no literary qualifications), and though full of matter valuable to the historian and geographer, it is so ill-arranged as to be in many cases almost unavailable. T. was one of the most remarkable of travellers; wholly devoid of classic sentiment, he traversed the plains of Troy, and passed the ruins of Persepolis without even a flutter of interest, and partly owing to this remarkable condition of mind, his statements are distinguished by an accurate truthfulness little common among travellers. But the chief value of his book lies in the fulness and accuracy with which the nature and state of oriental commerce, the chief markets and commercial routes, and the various systems of coinage and their relations are detailed. Some of his statements concerning the conduct of the Dutch in the East Indies called forth a most virulent and abusive reply from Jurieu, the Protestant theologian, in his *L'Esprit de M. Arnauld* (1684), and a more moderate one from Van Quellenburgh; but all T.'s assertions which were of any moment were found to be perfectly correct. His Travels were originally published in 3 vols. (two in 1676—1677, and the third in 1679); they have since been several times republished, last in 1810, in 7 vols.; and have been translated into English, Dutch, and German.

TAVIRA, Portugal. See SUPPLEMENT in Vol. X.

TA'VISTOCK, a parliamentary borough and market-town of Devonshire, picturesquely situated on the western border of Dartmoor, about 35 miles south-west of Exeter, in the fertile valley, and on the right bank, of the Tavy (whence its name), which is here crossed by two bridges within the town. T. is a thriving town, with some small manufactures of serges and woollen cloths, iron-foundries and mining-works, copper, lead, tin, and iron being found in considerable quantity in the neighbourhood; but the population is chiefly agricultural. It is a place of considerable antiquity, and was formerly of great importance, owing mainly to its abbey, the largest and most magnificent in Devonshire, which was founded in the year 961, for the Benedictine order, by Ordgar, Earl of Devonshire, father of the infamous Elfrida, and endowed with many privileges, the abbot, in the early part of the reign of Henry VIII., being admitted to the peerage. At the dissolution, in the same reign, when the revenue amounted to upwards of £900, it was bestowed upon John Lord Russell, in possession of whose descendant, the Duke of Bedford, the property still remains. A printing-press, the second set up in England, was established in the abbey at a very early period. Some remains of the ancient buildings still exist in the town. The parish church is a handsome edifice, with a tower at the west end, resting on arches, under which there is a thoroughfare. The borough has returned two members to parliament since the year 1295: at the breaking out of the Great Rebellion, Pym was one of the members. T. is one of the four stannary towns of the county, and is governed by a port-reeve, elected annually; a county court is held in the town. It is connected with Launceston and Plymouth by railway, and with the river Tamar by a canal, completed in 1817. Sir Francis Drake was born in the immediate neighbourhood in 1545, and the poet W. Browne in the town in 1590. Pop. (1881) of parliamentary borough, 6909.

TAVOY', the chief town of the province of Tavoy (see TENASSERIM), is situated on the left bank of the Tavoy River, about 34 miles from its mouth, in N. lat. 14° 4', E. long. 98° 5', at the distance of about 220 miles south of Maulmain. The site of T., which is low, is enclosed on three sides by rice-fields, and on the fourth by the river. The houses are scarcely visible from the river—umbrageous trees, palms, plantains, jacks, cassias, and hundreds of flowering shrubs nearly concealing them from view. A wooden-covered pier, supported on piles, forms a convenient landing-place. There is a hospital, a large jail, and a roomy *zayat*, or caravansary. The houses, according to the universal practice of the country, are raised from the ground on piles, and are made of bamboo, fastened with rattan, and thatched with the leaf of the water-palm. Under many of the houses, a loom may be observed, at which a female is generally busy at work. The shops are for the most part mere sheds or stalls, and the vendors sit squatted on the raised floor in the midst of their wares. 'In this little town,' says a recent eye-witness, 'Burman life and manners are seen in all their simplicity; and the observer cannot but be struck by the frugality, contentment, happiness, and enjoyment of life manifested by the people.' T. is remarkable for its grand annual buffalo-fight. The sport continues for two days, and during that time eight pair of buffaloes are brought into the field, each animal representing a different district or township. The rice-fields around T. are prolific sources of malaria. Intermittent fevers and dysentery are the most common diseases; but the climate is on the whole healthy, and is not considered inimical to the European constitution. According to the estimates of 1871—1872, the pop. of T. was 14,467. The bulk of these are true Burmans, the balance being made up with Shans and Thoungthoos, Karens, Chinese, Malays, and natives of India.

Vessels drawing not more than 12 feet of water can reach the town of T. by means of the Tavoy river. The anchorage for large ships is at Goodridge Plains, about 30 miles below the town.

Tavoy used to be one of the stations in which British troops were settled, but these have been lately withdrawn.

TAX, TAXATION. This term, as expressing the exaction of money from the individual for the service of the state, is familiar to all mankind a step above barbarism; and yet few subjects are surrounded by a greater number of practical difficulties and theoretical niceties. These may be grouped under two sets of considerations—those which affect the justice of a tax, and those which affect its productiveness, and these two often tell on each other. Taxation, indeed, has so frequently been the

means of perpetrating political injustice, that the term has fallen into bad popular repute. Whenever the produce of a tax is used otherwise than in the service of those who pay it, the tax is unjust. In its more oppressive form, it has been levied on conquered states, for the benefit of the conquerors, and in this shape it has sometimes been called tribute. The direction which all constitutional struggles to cleanse taxation from injustice have taken has been that of self-taxation, the community as a whole deciding on what it requires to take from the individual members for the public service. The accomplishment of this has been the chief object of all the struggles which have made a free constitution for the British Empire. There were old feudal dues which the monarchs had the power of exacting; but when these were insufficient for their ambitious projects, they had to ask parliament for a supply, and parliament generally took the opportunity of granting it to demand redress of grievances. It came thus to be a fundamental constitutional doctrine, that no tax can be levied save by the consent of the representatives of the people who have to pay it. The constitutional doctrine thus created by Britain was remembered by the American colonies when Mr Grenville sought to raise there a stamp-duty and a customs-duty on tea, and the colonies revolted under the celebrated cry that 'Taxation without representation is tyranny!'

It was discovered, in the course of the long struggle of the House of Commons to keep its hold on the purse, that the least afflictive of taxes may be the most dangerous. A fixed land-tax comes, for instance, to be no impost at all, in the afflictive sense of the term. If a thousand a year has been drawn off a certain acreage of land from time immemorial, the proprietors never possessed that part of the rents, and are no more sufferers from not having them than from not possessing their neighbours' estates. A government with a large revenue of this kind, however, will certainly be inimical to freedom. The time when the liberties of England were in the greatest danger was the twelve years of Charles I.'s reign in which he was able to get on without going to parliament for money. The extravagance of sovereigns who wasted the domains of the crown has generally prevented them from having too formidable an influence by the possession of independent incomes. In Britain, this difficulty has been effectually guarded against, and any of the expenses of the crown which can now be paid without going annually to parliament for a vote of supply are of a very trifling character.

How to make taxation productive, is a vast and complicated practical science. Turgot, one of the wisest of financiers, called it the art of plucking the goose without making it cry. The most ingenious devices to this end, however, have often, in practice, met with counteracting difficulties. It was supposed that indirect taxation—that is, a duty levied on articles before they reach the consumer, must, in a civilised and orderly country, be almost inexhaustible. The merit of the system lay in the consideration, that the burden of the tax did not fall on the person who paid it. Income-tax, house-tax, dog-tax, and the like are levied directly on the person on whom the burden ultimately falls, and if he do not pay, the amount will be taken by force. Tea-duty, sugar-duty, and wine-duty, however, are not levied on the consumer, though he has to pay them; they are levied on the importer, who has no, or a very slight, interest against the tax, since he must charge it on the consumer. But this form of taxation is met by checks. If it is excessive, people will not buy the taxed article; and it has often been found that reducing the duty increases the revenue. An indirect tax on luxuries, and especially on those which may be used to vicious excess, has strong recommendations. In some cases, it is no great calamity should the tax throw the article nearly out of use. But then comes another check in the smuggler, whose profession may probably do more to corrupt and disorganise society than the free use of the article in which he deals. A tax on the necessaries of life, on bread or salt, cannot be evaded, as in the case of luxuries, by the abandonment of use, and therefore it is very productive, but it is also very oppressive. The tax on salt in France was one of the chief causes of the French Revolution. The happiest condition for the revenues of a country is when luxuries are so abundantly used by all classes that a small addition to their price is a slight burden, yet yields a large revenue. In this country, the revenue thus derived from tea, sugar, and stimulants may be set down in round numbers at 30 millions. The chief taxes which now form the revenue of Britain are—1. Those by old custom called 'assessed,' and levied upon certain items in the possessions and enjoyments of the citizen, as his house-domestics, horses, dogs, and armorial bearings. 2. The property and income tax, which, after long disuse, was renewed in 1842, and is raised from time to time according to the exigences of the government. 3. The customs. 4. The excise. 5. The stamps and post-office; and 6. The land-tax. See CUSTOMS DUTIES, EXCISE, POST-OFFICE, STAMPS, LAND-TAX, FINANCE.

TAXA'TION OF COSTS is the checking or reviewing of the charges made by attorneys or solicitors for legal business; and there is an officer of the court provided for the purpose, called in England a master or a taxing-master, or a registrar, according to the nature of the court; in Scotland, he is called an auditor. Solicitors differ from all other professions in this, that they are treated as officers of the court, and they are not at liberty to charge what prices they please for the various services they perform. Hence, every step in a suit has a certain value put upon it by the court, and the business of the taxing-officers is to see that this standard is not trangressed. There are many exceptional matters, however, which arise in every suit, which often cause difficulty in apportioning a proper amount of remuneration, the taxing-officer having a considerable discretion. In consequence of a taxing-officer being provided by the court, it is a right which every client of a solicitor has, if not satisfied with the bill of costs delivered to him, to have it referred to the taxing-officer to be taxed. But in general, this must be done without delay. If the taxing-officer certify that more than one-sixth too much has been charged, then not only is the client not bound to pay the excess, but the expense of the taxation must be borne also by the solicitor; whereas if less than one-sixth is taxed off, the client has to bear the expense of taxation. Not only are the expenses of a suit liable to taxation, but other kinds of miscellaneous business which a solicitor does as a solicitor. It has often of late been made matter of complaint that solicitors are not allowed to fix their own charges, or to agree with clients upon an arbitrary charge, or a charge by commission, the tendency of the present system being to make the solicitor anxious to eke out his remuneration by lengthening the proceedings, so as to make a basis for chargeable items; but the legislature has steadily rejected hitherto all attempts to abolish the check provided by taxation.

TAXEL. See BADGER.

TAXICO'RNÉS, a family of coleopterous insects, of the section *Heteromera*, having the body

generally square; the thorax either concealing or receiving the head; the antennæ short; the legs adapted for running. Most of them are found in fungi and beneath the bark of trees. They are widely distributed over the world.

TA'XIDERMY, the art of preparing the skins of animals for the purposes of the naturalist. The chief means employed in preparing the skin for stuffing in the case of small animals is to remove it carefully from the body, and, having cleaned away from it any adherent flesh, &c., to anoint it with arsenical soap; for the making of which there are several formulæ, the following being the most used: arsenic, 1 ounce; white soap, 1 ounce; carbonate of potash, 1 drachm; distilled water, 6 drachms; camphor, 2 drachms. This keeps the skin supple, and prevents decay and the attacks of insects. The larger skins are generally prepared with a composition called Preservation Powder, which is made of the following ingredients: Arsenic and burnt alum, each 1 lb.; powdered oak-bark, 2 lbs.; camphor, ½ lb. These substances are all reduced to a powder, mixed, and passed through a fine sieve. It requires to be carefully kept in well-stoppered bottles or jars, and when used, is thickly sprinkled over the flesh-side of the skin whilst still wet, and must be thoroughly rubbed in. Gloves should always be worn in this process, to prevent danger from the poisonous compound. Some skins are prepared with alum only, and others with the oak-bark liquor of the tanner's pits. This, in the case of very large skins, answers very well.—Besides the mere preparation of the skin, the art of taxidermy is held to mean also the stuffing and mounting of them. This requires much personal experience, and as almost every group of animals must be treated differently, it is impossible to explain the various methods fully in this short notice. Various works have been written upon the subject.

TAY, the largest river in Scotland, draining nearly the whole of Perthshire (q. v.), and pouring into the German Ocean a greater bulk of water than any other British river, has its source in the western part of the county of Perth. The Dochart, the principal feeder of Loch Tay, rises in Ben Lui, on the borders of Argyleshire, and flowing in a north-east direction, is joined by the Lochy, just before the united streams enter the lake. After leaving it, the Tay flows for some distance east-north-east, when turning southwards it passes, with a very winding course, Dunkeld (q. v.) and Perth (q. v.); about a mile below the latter place, it again changes its direction to east-north-east, widening at the mouth of the Earn (q. v.) into an estuary—the Firth of Tay—which varies from three-fourths of a mile to three miles in breadth, and lies mostly between the counties of Fife and Forfar, joining the German Ocean about ten miles below Dundee (q. v.). From the north and east, the Tay receives the Lyon, the Tummel and Garry, and the Isla; and from the west, the Almond and the Earn; its entire basin comprises an area of about 2500 square miles. The salmon-fishings on the Tay and its tributaries are of considerable value. The Stormontfield ponds for the propagation of salmon are 5 miles above Perth. The tide flows up the river to about a mile above Perth, to which place it is navigable by vessels of 100 tons; and to Newburgh, about 20 miles from its mouth, by vessels of 500 tons; the navigation up to Dundee, notwithstanding the many precautions which have been taken, is attended with very great difficulty, on account of the numerous and shifting sand-banks.

LOCH TAY is a long and narrow lake, picturesquely situated in a basin scooped out of the bosom of the mountains, 355 feet above the sea-level, in length about 15 miles, and average breadth 1 mile, varying from 100 to 600 feet in depth. Ben Lawers (q. v.) lies on its west side. The loch is at times subject to violent and unaccountable agitations.

TAYLOR, BAYARD, an American author and traveller, born at Kennett Square, Chester County, Pennsylvania, January 11, 1825. Having received a common school education, he was apprenticed at 17 in a printing-office, and at the same time began his poetical contributions to periodicals; and in 1844 he published a volume of poems under the title of *Ximena.* Soon after, with a small fund from this and other sources, he started on a pedestrian tour of Europe, and in 1846 published *Views Afoot, or Europe seen with a Knapsack and Staff.* After his return, he spent a year editing a country newspaper in Pennsylvania, when he went to New York, and wrote for the *Literary World* and *Tribune.* Of the latter, he became assistant-editor and shareholder in 1849, and in the interests of that journal, as its correspondent, made extensive travels in California and Mexico, recorded in *El Dorado, or Adventures in the Path of Empire,* 1850; up the Nile to lat. 12° 30′ N., and in Asia Minor, Syria, across Asia to India, China, and Japan—recorded in his *Journey to Central Africa, Lands of the Saracen,* and *Visit to India, China, Loo-Choo, and Japan,* 1853. His later explorations are recorded in *Northern Travel, or Summer and Winter Pictures of Sweden, Denmark, and Lapland,* 1856; and *Travels in Greece and Russia, with an Excursion to Crete,* 1857. During this life of travel and authorship his best writings were in verse. In 1848, he published *Rhimes of Travels, Ballads, and other Poems;* in 1851, *Book of Romances, Lyrics, and Songs;* in 1854, *Poems of the Orient;* in 1855, *Poems of Home and Travel;* in 1859 and 1862, *At Home and Abroad,* and edited a *Cyclopædia of Modern Travel; Hannah Thurston,* a novel, 1864; *Story of Kennett,* and *Picture of St. John,* 1866; *John Godfrey's Fortune,* and a translation of Goethe's *Faust,* in 1870; *Joseph and his Friend,* 1871; *The Mosque of the Gods,* 1872; and *Egypt and Iceland,* 1874. He was appointed U. S. minister to Berlin, where he died Dec. 19, 1878.

TAYLOR, BROOK, a celebrated English mathematician, was born at Edmonton August 18, 1685, entered St. John's College, Cambridge, in 1701, at a time when mathematical science was the prominent pursuit among the learned, took his degree of LL.B. in 1709, became a Fellow of the Royal Society in 1712, and its secretary in 1714, in which latter year he also took the degree of LL.D. Though so young, he had become widely known in Britain and on the continent for great proficiency in mathematical knowledge, and power and versatility of mind, having already written various valuable treatises on capillary action, on the vibration of a string, on music, &c. In 1716, he visited Paris, and was received with warm demonstrations of regard by the French savans, who respected his ability and learning, and the prominent and distinguished part he had taken in the Leibnitzian controversy. On his return to England in 1717, he resumed his habits of severe study, but was forced by declining health to resign the secretaryship in 1718. For the next three years he wandered about, residing now on the continent, now in England. He died, December 29, 1731, at the age of 46. Besides his earlier works above mentioned, he contributed a series of able papers on higher algebra, dynamics, and general physics, published separately his *Methodus Incrementorum* in 1715, and a *Treatise on Linear Perspective,* the first general exposition of this subject, in 1719. During the last ten years of his life

he gave himself up almost entirely to metaphysical and biblical studies. His *Methodus Incrementorum* contains, besides the famous 'theorem' (see TAYLOR'S THEOREM), the first germs of the calculus of finite differences, various now common forms of infinitesimal series, with mechanical, physical, and algebraical applications. The chief use made by T. of his theorem is in a paper (1717) entitled 'Method of Approximation to the Roots of Equations.' The results of his investigations may be found in the *Phil. Trans.* (1713—1723), and in his two works above mentioned.

TAYLOR, ISAAC, born at Lavenham, in Suffolk, 1787, died at Stanford Rivers, in Essex, 1865, eminent as a Christian philosopher, artist, and mechanician, was the third of his name who attained distinction—his grandfather and father (known as Isaac Taylor of Ongar) being both named Isaac, and each in his way distinguished. His eldest son, also named Isaac, has given promise in his *Words and Places* that he will promote the credit of the family name. Charles Taylor, the editor of 'Calmet;' Jane Taylor, author of the Q. Q. papers, and joint-author with her sister, Ann—Mrs Gilbert of Nottingham, who died in 1866—of *Hymns for Infant Minds*, belong to the same talented family. The literary career of Isaac T. extended over nearly half a century. It began in 1818, in contributions to the *Eclectic Review*, for which Robert Hall, John Foster, and Josiah Conder then wrote, and ended in 1865, in contributions to *Good Words*, in which the name of the veteran figured with those of men who were unborn when he was in the height of his reputation. Between 1822 and 1827, he published *Elements of Thought; Characters of Theophrastus*, with illustrations, etched by himself; *The History of the Transmission of Ancient Books to Modern Times*, *The Process of Historical Proof*, a translation of Herodotus, and the *Memoirs and Correspondence of Jane Taylor*, his sister, who has already been mentioned. In 1829, he published, anonymously, *The Natural History of Enthusiasm*, which ran rapidly through several editions; and between 1829 and 1836, he published in succession *Fanaticism*, *Spiritual Despotism*, *Saturday Evening*, and *The Physical Theory of Another Life*. In 1836, appeared *Home Education*. Thereafter, he was a long time occupied upon a new translation of Josephus, undertaken jointly with the Rev. Dr Traill, and which was illustrated by etchings executed by himself. Within the last thirteen years of his life appeared *Loyola*, *Wesley*, *The Restoration of Belief*, *Logic of Theology*, *Ultimate Civilisation*, and *The Spirit of Hebrew Poetry*. Besides these numerous works, Isaac T. wrote many articles for the graver quarterly reviews, which are as yet uncollected. He had been educated as an artist, and some of his designs, executed before he betook himself chiefly to literature, have evoked the warmest praise from the most scrupulous critics, who have wondered how one with such a genius for art could have deserted it. It would be impossible to give here any account that would be intelligible of his numerous mechanical inventions; it must suffice to say, that, by two of his inventions, he revolutionised the art of calico-printing. As is too often the case, the profits of his discoveries have been and are being reaped by others. Isaac T. married in middle life, and had a large family, whose home education, as liberal-minded but pious Christians, was among, and not one of the least of, the tasks of his life. Two incidents connected with the work with which his name is most popularly associated—viz., *The Natural History of Enthusiasm*—may be mentioned in concluding this brief notice. Sir James Stephen wrote an able article in the *Edinburgh Review*, being an imaginary biography of the anonymous writer; and seven years after the publication, Dr Chalmers publicly called upon the author to declare himself, and come forward as a candidate for the chair of Logic in the university of Edinburgh. The flattery of this challenge could not be resisted. Isaac T. declared himself, and became a candidate for the chair, which he nearly won. He was beaten by Sir William Hamilton, whose local influence gave him a small majority of the electors.

TAYLOR, JEREMY, one of the greatest names in the English Church, was the son of a Cambridge barber, and was born in that town, August 15, 1613. At the age of 13, he entered Caius College as a sizar, and after seven years' strenuous and brilliant study in classics and theology, took the degree of M.A. Like Archbishop Usher, he was admitted to holy orders before he had reached his 21st year. Soon after, he attracted the notice of Laud (who had a regard for learning, if none for liberty), and was preferred by him to a fellowship at All Souls, Oxford (1636). About the same time, he was appointed chaplain in ordinary to the king; and in 1638, rector of Uppingham, a preferment which he retained till the successes of the Parliamentarians deprived him of it. The first notable publication of T.'s was a defence of the church, entitled *Episcopacy asserted* (Oxford, 1642). It procured for him the honour of D.D. During the next three years, T. probably accompanied the royal army; but when fortune had unmistakably declared against the king, he withdrew into Wales (1645—1646), and, in conjunction with Mr W. Wyatt of St John's College, Oxford, opened a school at Newton, in Caermarthenshire. It appears to have been a pretty successful adventure, and many of his scholars, we are told, 'having, as it were, received instruction from this prophet in the wilderness, were transplanted to the universities.' T. also found a patron in the Earl of Carbery, who was then living at the family seat of Golden Grove, in the same county, and who appointed him his domestic chaplain. But if this period of T.'s life had become to the outward eye obscure and mean, it is rendered illustrious by the splendour of his literary achievements. Between 1647 and 1660, the long 13 years of his enforced seclusion, appeared all his great works, and remembering their unsurpassed merits, we are almost disposed to feel grateful to those who expelled him from his rectory, and drove him to strictly literary pursuits. In 1647, was published the *Liberty of Prophesying*, a work written on behalf of the clergy of the Church of England, who were being expelled from their livings by the victorious Puritans, but in which the pleadings are based on principles far more comprehensive and tolerant than the age was disposed to acknowledge; in 1650, the *Life of Christ* (2 vols.), one of the most popular of his productions, and *The Rule and Exercises of Holy Living;* in 1651, *The Rule and Exercises of Holy Dying*, a portion of his *Sermons*, and the *Discourse of the Divine Institution, Necessity, and Sacredness of the Office Ministerial;* in 1652, a *Discourse on Baptism, its Institution, and Efficacy upon all Believers;* in 1653, 25 additional *Sermons;* in 1654, *The Real Presence and Spiritual of Christ in the Blessed Sacrament;* in 1655, *The Guide of Infant Devotion, or the Golden Grove*, and the *Unum Necessarium, or the Doctrine and Practice of Repentance*, a decidedly Pelagian treatise, which involved him in a considerable controversy; in 1657, a *Collection of Polemical and Moral Discourses*, a *Discourse on Friendship*, &c.; and in 1660, his famous *Ductor Dubitantium, or the Rule of Conscience in all her General Measures*, the most learned, subtle, and curious of all T.'s

works. It was dedicated to Charles II. T. was a stanch royalist, a splendid scholar, a consummate theologian, and a man of wonderful literary genius, and so it was in the nature of things almost impossible that he should escape preferment. Before 1660 had expired, he was elevated to the bishopric of Down and Connor, a dignity which he only retained some seven years, dying August 13, 1667. T. was not happy in his Irish see. Before a year was over, he was anxious to be delivered from it as from 'a place of torment.' The Scotch Presbyterian ministers were 'incendiaries'—they robbed him of the 'people's hearts;' they even 'threatened to murder' him; his only hope was in the government and the military. Altogether, it is a melancholy spectacle to behold the finest ecclesiastical genius of the time half broken-hearted by petty squabbles with intolerant fanatics, who had, nevertheless, in the points at issue between them and T., something like justice on their side. No modern mind would hesitate for an instant to acknowledge that the Scoto-Irish Presbyterian clergy were perfectly entitled to act as they did, and yet we fear it is too plain that the good bishop would have gladly seen them prohibited by an Episcopalian soldiery. Nay, the author of the *Liberty of Prophesying* went a step further; and on one occasion, only three months after his consecration, actually deposed 36 Presbyterian ministers occupying livings which the Restoration had inconsiderately and tyrannically declared to be Episcopalian. Some very interesting information in regard to this all but unknown period of T.'s life is to be found in *Notes and Queries* (November 11, 1865).

T., sometimes styled the modern Chrysostom (q. v.), on account of his golden eloquence, has no equal in the whole series of ecclesiastical writers for richness of fancy. All other divines—patristic, medieval, and modern—shew poor and meagre beside him in this respect. Some are more logical, or penetrating, or profound; some grasp more clearly the spiritual significance of doctrine, or display a deeper knowledge of human nature; but T. ranks among the first men of his age in point of learning, subtlety of argument, elevation of devout feeling, and philosophic largeness of view, while his inexhaustible imagery, shining 'like the glossy purples of a dove's neck,' and full of all tender and pathetic beauty, reminds us of Spenser and Shakspeare, of Sidney and Fletcher, rather than of the sombre order of theologians.—The best edition of T.'s works is by the Rev. C. P. Eden, M.A., Fellow of Oriel College, Oxford (10 vols., London, 1854).

TAYLOR, Zachary, twelfth President of the United States, was born in Orange County, Virginia, November 24, 1784, son of Colonel Richard Taylor, an officer of the War of Independence, and one of the first settlers of Louisville, Kentucky, where T. was taken in early childhood, and grew up to his 24th year, working on a plantation, with only the simplest rudiments of education. His elder brother had received a lieutenancy in the army, and died in 1808, when T. was appointed to the vacant commission. In 1810, he was promoted to a captaincy; and in 1812, with 50 men, two-thirds of whom were ill of fever, he defended Fort Harrison, on the Wabash, against a large force of Indians led by the famous chief Tecumseh. Promoted to the rank of major for his gallantry, he was employed during the war in fighting the Indian allies of Great Britain. In 1822, he built Fort Jesup; in 1832, he served as colonel in the Black Hawk War; and in 1836, was ordered to Florida, where he gained an important victory over the Seminole Indians at Okechobee, for which he was appointed brigadier-general, and made commander of the United States forces in Florida. In 1840, having been appointed to the command of the south-western department, he purchased an estate at Baton Rouge, Louisiana. On March 1, 1845, the United States Congress passed the resolution for the annexation of Texas, formerly a province of Mexico, and for some time an independent republic. Texas claimed the Rio Grande for her south-western boundary; Mexico insisted that there could be no claim beyond the Nueces, and prepared to defend the disputed, if she could not reconquer the whole, territory. General T. was ordered to Corpus Christi, which point he occupied in November with a force of 4000. On March 8, 1846, he moved towards the Rio Grande, across the disputed territory, and built Fort Brown, opposite and commanding the Mexican port of Matamoras. General Ampudia, the Mexican commander, demanded that he should retire beyond the Nueces, pending negotiations; and on the refusal of General T., his successor, General Arista, crossed the Rio Grande with a force of 6000. On May 8, he was defeated at Palo Alto by General T., with a force of 2300; and a few days after, driven from a new position at Resaca de la Palma across the Rio Grande. War was declared by Congress to exist by the act of Mexico; 50,000 volunteers were called for, T. made major-general, reinforced, and ordered to invade Mexico. On September 9, with 6625 men, he attacked Monterey, which was defended by about 10,000 regular troops. After 10 days' siege and 3 days' hard fighting, it capitulated. General Scott having been ordered to advance on the city of Mexico by Vera Cruz, withdrew a portion of the troops of General T., leaving him only 5000 volunteers and 500 regulars, chiefly flying artillery, to meet an army of 21,000, commanded by President Santa Anna. He took a strong position at Buena Vista, fought a desperate battle, and won a decided victory. This victory, against enormous odds, created the utmost enthusiasm; and General T., popularly called 'Old Rough and Ready,' was nominated for President of the United States over Henry Clay, Daniel Webster, and General Scott; and this 'ignorant frontier colonel, who had not voted for forty years,' and was a slaveholder, was triumphantly elected, over General Cass, the democratic, and Martin Van Buren and Charles Francis Adams, free-soil candidates. Entering upon the presidency in 1849, he found a democratic majority in Congress, with a small but vigorous free-soil party holding the balance of power, while the most exciting questions connected with the extension of slavery, as the admission of California, the settlement of the boundaries of Texas, the organisation of the newly-acquired Mexican territories, &c., were agitating the country, and threatening a disruption, postponed by the compromises introduced by Mr Clay. Worn down by the unaccustomed turmoil of politics, the rough, good-natured old soldier did not long enjoy his honours. One year and four months after his inauguration, he was attacked with bilious colic, and died July 9, 1850.

TAYLOR'S THEOREM, so called from its discoverer, Dr Brook Taylor (q. v.), is a general method for the algebraic development of a function of a quantity, x, in powers of its increment h, and may be thus briefly explained and illustrated. Let $f(x+h)$ denote *any* function of $x+h$ (subject to the limitations below), then $f(x+h) = f(x) + f'(x)h + f''(x)\frac{h^2}{1.2} + f'''(x)\frac{h^3}{1.2.3} + \ldots$, where $f(x)$ is the same function of x, as $f(x+h)$ is of $x+h$, and $f'(x), f''(x)$, &c., are the first, second, &c., differential coefficients of $f(x)$. By a supplementary theorem, due to Lagrange, who was the first to

appreciate to the full the value of Taylor's discovery, it was shewn that the sum of all the terms of the series after n terms, could be represented by $f^n(x+\theta h)\frac{h^n}{1.2\ldots n}$, where θ is some positive fraction less than unity. The theorem supposes that between certain limits, indicated by $h = o$, and h = some finite quantity, neither $f(x)$ nor any of its derived functions vanish, or all of them do not become infinite; and the cases in which these conditions are not satisfied are often spoken of as instances of the 'failure of Taylor's theorem.' An important particular case of this theorem, known as *Maclaurin's*, or (more properly) *Stirling's Theorem*, was independently discovered; it is that case of the general theorem in which the various functions of x are made functions of zero, and is written $f(o+h) = f(o)+f'(o)h+f''(o)\frac{h^2}{1.2}+$, &c. The best illustrations of these theorems are the binomial, exponential, logarithmic, and circular series; thus, if the function be $(x+h)^n$, then $f(x) = x^n$, $f'(x) = nx^{n-1}$, $f''(x) = n(n-1)x^{n-2}$, &c.; and by substitution of these values we obtain Newton's *binomial* theorem; if the function be a^{x+h}, Taylor's series gives us as its equivalent $a^x(1+h\,.\log.\ a+\frac{h^2}{1.2}(\log.\ a)^2+\ldots.)$; and Maclaurin's gives $a^h = 1+h\ .\ \log.\ a+\frac{h^2}{1.2}(\log.\ a)^2+\ldots.$, which latter is the *exponential* theorem, and may be obtained from Taylor's series by division; if the function be log. $(1+x+h)$, (log. $x+h$ being one of the cases in which Taylor's theorem fails), then Maclaurin's series gives the *logarithmic* theorem, log. $(1+h) = h-\frac{h^2}{2}+\frac{h^3}{3}$,—, &c.; and the same theorem gives the various series expressing the values of sin. h, cos. h, sin. ^{-1}h, &c. &c. The history of this celebrated theorem is remarkable. On the first publication of the *Methodus Incrementorum*, it was entirely neglected by Leibnitz, who, in ignorance of its value, severely criticised the whole work; while the bitter hostility of John Bernouilli to British men of science, blinded him to the existence of any merit in any part of the work. The theorem never appeared in any of the works on the calculus published before D'Alembert's *Recherches*, and after that, was given only in the French *Encyclopædia;* but neither D'Alembert nor Condorcet seems to have known that it was Taylor's, or to have fully appreciated its importance; and it was not till Lagrange, in the *Berlin Memoirs* for 1772, gave the name of its true author, and proposed to make it the foundation of the differential calculus, that it assumed that important position which it deserved to hold.

TCHAD, or TSAD, LAKE, a large lake in Sudan, Northern Africa, lat. 12° 30′—14° 30′ N., long. 13°—15° 30′, is bounded on the N. by the kingdom of Kanem, and on the S. by those of Bagirmi and Bornu. It is 200 miles—by some accounts, upwards of 300 miles—long, 170 miles broad, and has an elevation of 800 feet above sea-level. The shores are low, and for the most part unattractive; and a strip of swampy ground surrounds the fine open sheet of water which is the actual T., and the margin of which is lined by papyrus and tall reeds, of from 10 to 14 feet in height. Its depth in ordinary years is from 8 to 15 feet, but in some years the waters rise much higher; and of the islands, of which there are many densely peopled, only the more elevated afford shelter to the inhabitants. River-horses and crocodiles swarm in the lake, and fish and water-fowl are abundant. The banks are infested by a tribe called the Budduma or Jedina, who live by piracy. The inhabitants are black or dark-brown, have regular features, and are decently clothed. From the north, the Waube, a river 400 miles in length, enters the lake; and from the south, the Shari, which in its lower course is upwards of 1800 feet broad. The T. has no outlet, according to Dr Barth, and its waters are perfectly fresh. Dr Overweg spent six weeks in exploring the islands of the lake, and he died and was buried on its banks.

TCHERKA'SK, STAROI (Old Tcherkask), a town of South Russia, formerly the capital of the country of the Cossacks of the Don, stands on the right bank of the Don, 12 miles south of New Tcherkask (see NOVOTCHERKASK), the present capital. Pop. 5278.

TEA (*Thea*), a genus of shrubs of the natural order *Ternstrœmiaceæ*, very nearly allied to the genus *Camellia* (q. v.), and distinguished from it only by the not deciduous calyx, and by the dissepiments remaining connected in the centre of the capsule after it opens. The genus seems to derive its importance entirely from a single species, the dried leaves of which are the tea of commerce, one of the most important articles of commerce in the world, and yielding the most esteemed and extensively used of all non-alcoholic beverages. This species, the tea shrub or CHINESE TEA (*T. Sinensis*), is 20—30 feet high, but in a state of cultivation only 5—6 feet high, with numerous branches and lanceolate leaves, which are 2—6 inches long. The flowers grow singly or two or three together in the axils of the leaves; they are rather large, white, and fragrant, with 5-parted calyx, 6—9 petals, and many stamens. By cultivation for many centuries, numerous varieties of this plant have been produced in China, some of which have been reckoned as distinct species, particularly *T. viridis*, formerly supposed to yield green tea, *T. Bohea*, formerly supposed to yield black tea, and *T. stricta*. Of these, the first-named has the longest, and the last has the shortest leaves The Assam Tea, which has been called *T. Assamensis*, appears also to be a mere variety of the same species.

Tea Plant (*Thea Sinensis*)

The cultivation of tea in China is chiefly confined to the regions between N. lat. 24°—35° and E. long. 115°—122°. Tea for domestic use is, however, cultivated both in more southern and more northern regions. The plant is to be accounted subtropical, but bears a tropical climate well, and can also accommodate itself to cold winters. In the neighbourhood of London it often endures all the frost of winter without protection. In few of the countries into which it has been introduced, however, is the flavour of the dried leaf such as it is in China. The use of tea is said to have been introduced into China itself from the Corea about

the 4th c. of the Christian era, and to have extended to Japan about the 9th century. The Chinese cultivate it chiefly on the southern slopes of hills, in poor but well-watered soil, to which no manure is applied. A new plantation is made by sowing the seed in holes at proper distances, two or three seeds being put into a hole to secure a plant. The first crop is obtained in the third year, when the shrub is by no means full-grown. When about seven years old, it yields only a scanty crop of hard leaves, and is cut down, when new shoots rise from the root, and bear fine leaves in abundance. This is repeated from time to time, till the plant dies, at about the age of thirty years.

History and Commerce.—All that can be affirmed regarding the early history of this beverage is, that it appears to have been used for ages in China, where it is believed by the natives to be indigenous. It first became known to Europeans at the end of the 16th c., though it is only mentioned by the Portuguese writer Maffei in his *Historiæ Indicæ*, who refers to it as a product both of China and Japan. The first reference to it by a native of Britain is in a letter dated 27th June 1615, written by a Mr. Wickham, which is in the records of the East India Company; and it is curious to observe that both the Portuguese and English writers referred to use their own rendering of the native name, which is *tcha*. Maffei calls it *chia*, and Mr Wickham, *chaw*. From this time, it became gradually known to the wealthy inhabitants of London, in the form of occasional presents of small quantities from India, obtained from China, or by small lots in the markets from time to time, but always exorbitantly dear, fetching sometimes as much as £10 the lb., and never less than £5. A rather large consignment was, however, received in 1657; this fell into the hands of a thriving London merchant, Mr Thomas Garway, who established a house for selling the prepared beverage; and that house, under the name of 'Garraway's Coffee-house,' is still a famous establishment in that city. From 1660 until 1689, a duty was levied on the drink made with tea at the rate of 8*d.* per gallon; but from the latter date a duty of 5*s.* per lb., with an addition of 5 per cent. *ad valorem*, was levied. For many years, the duties, although occasionally changed, were always very high. The expiration in 1833 of the charter of the East India Company, which had held a complete monopoly of the tea-trade, produced a change; the *ad valorem* duty was abolished, and differential duties of 1*s.* 6*d.*, 2*s.* 2*d.*, and 3*s.* per lb. were substituted in 1836 for one uniform rate of 2*s.* 1*d.* per lb., to which, in 1840, was added an additional 5 per cent.; at present the duty is only 6*d.* per lb. The import of the year ending 31st March 1866 was upwards of 33,000,000 pounds-weight; amounting in value to nearly £7,000,000 sterling. In 1869 Great Britain imported 139,223,298 lbs., valued at £10,311,465, of which 111,795,639 lbs. were for home consumption. The consumption of the United States in 1870 was 40,812,188 lbs., valued at $12,386,973.

Much mystery and error for a long time existed upon the subject of the species producing the tea of commerce. By many it was said that the qualities known as black teas were produced by the species known to botanists as *Thea Bohea*, and the green teas from *T. viridis*. Others held that only one species was used to make both the black and green varieties, and that the difference arose from the method and time of preparation. The eminent botanical traveller, Mr Robert Fortune, has, however, entirely set the question at rest by investigating the matter on the spot. He found that in the Canton district, where black teas alone are prepared, only the *T. Bohea* is grown; whilst in the province of Che-kiang only *T. viridis* is grown, and green teas made. But the cultivation of the latter plant he also found to be absolutely universal in the Fokien district, although the inhabitants make only black teas. The tea-farms are mostly in the north of China, and are usually of small size, and require much attention; for the plant will only thrive in well-manured or very rich soil, and the spaces between the plants, which are four feet apart, must be kept in good order, and free from weeds. The farms always occupy the hill-sides, where the soil is deep and well drained. Although an evergreen, the leaves can only be gathered at certain seasons: the first is in April, when the new leaves begin to burst from the buds; and some of these in their most tender state are gathered and made into young hyson of the finest quality; so fine, indeed, that it has rarely been brought to England, because it is said to lose flavour by the sea-voyage. Much is, however, sent overland to Russia, where it fetches an exorbitant price. The ordinary picking begins just after the summer rains are over, at the beginning of May; and later in the season, a third picking takes place, the produce of which is inferior, and used only by the poorer classes of the country. The later gatherings are more bitter and woody than the earlier, and yield less soluble matter to water. The leaves, when freshly plucked, possess nothing of the odour or flavour of the dried leaves, these properties being developed by the roasting which the leaves undergo in the process of drying. Moreover, different qualities of tea are prepared from the same leaves, which may be made to yield green or black teas at will.

For a description of the specific processes for obtaining the green and the black teas generally, we refer to Mr Fortune's work (*Tea Countries of China*), or to Johnston's *Chemistry of Common Life*, vol. i. p. 161, in which it is quoted. It is sufficient here to remark, *first*, that, in the process of drying, the leaves are roasted and scorched in such a way as necessarily to induce many chemical changes in them; the result of such changes being to produce the varieties of flavour, odour, and taste by which the different kinds of teas are distinguished; and *secondly*, that the different colours of green and black teas are due to the mode in which the leaves are treated. For *green teas*, the leaves are roasted in pans almost immediately after they are gathered. After about five minutes' roasting, during which they make a cracking noise, become moist and flaccid, and give out a good deal of vapour, they are placed on the rolling-table, and rolled with the hands. They are then returned to the pans, and kept in motion by the hands: in about an hour, or rather more, they are well dried, and their colour, which is a dull green, but becomes brighter afterwards, has become *fixed*. The essential part of the whole operation is now over, nothing more being required than to sift and re-fire it. For *black teas*, the leaves are allowed to be spread out in the air for some time after they are gathered; they are then further tossed about till they become flaccid; they are next roasted for a few minutes, and rolled, after which they are exposed to the air for a few hours in a soft and moist state; and lastly, they are dried slowly over charcoal fires, till the black colour is fairly brought out. Hence the dark colour and distinguishing flavour of black teas seem due to the long exposure to the atmosphere in the process of drying, and the oxygen of the air acting rapidly upon the juices of the leaf, and especially upon the astringent principle during this exposure. For the purpose of giving special scents to different varieties of tea, numerous odoriferous plants are employed in different parts of

China; the cowslip-coloured blossoms of the sweet-scented olive (*Olea fragrans*) communicate an especially fragrant scent to tea.

The adulteration of tea, when the duty was very high, was probably carried on to a great extent; but notwithstanding the terrible tales of alarmists, it may be confidently asserted that no adulteration of tea is now carried on in Great Britain. In China, spurious teas have been prepared and sent to this country under the name of 'Lie teas,' but they had no sale, and of course were discontinued. The Chinese give an artificial colouring to the green teas sent to Europe because it pleases the eye, but the colouring matter is very innocuous, and is never produced by heating over copper plates—a popular error, which has been persisted in for a long time without a shadow of truth for its foundation. Prussian blue in very minute proportion, and a species of native indigo and gypsum, are the real materials employed for giving the face, as it is called.

In 1836, the culture of tea was attempted on a large scale in India, under the direction of the able and indefatigable botanists, Dr Royle and Dr Falconer; and after some difficulty, a good supply of plants was introduced to the districts of Kumaon and Gurhwal, and in the meantime plantations formed at an earlier period in Assam were making great progress: from these sources, a small but steadily increasing supply is received, and the quality is superior to a large portion of the ordinary Chinese teas; indeed, there is every reason to hope that ere long India will chiefly supply our wants in tea. Tea of excellent quality is produced in the high lands of Brazil. It has also been successfully grown in Tennessee. California will probably become a tea-producing country; 27,000 plants were introduced in 1870.

The varieties of tea are very numerous; the following are those found in the shops of Great Britain:

GREEN TEAS.—*Chinese:* (1) Gunpowder sorts—viz., Shanghae, Ping-suey or Pin's-head, Moyune, Imperial Moyune, and Canton; (2) Hyson sorts—viz., Shanghae, Shanghae young, Moyune, Moyune young, Canton young, and Twankay or Imperial Hyson. *Japanese:* Gunpowder and Young Hyson. *Java:* Gunpowder.

BLACK TEAS.—*Chinese:* (1) Congo sorts—viz. Canton, Foo-chow-foo, Hung-muey, Oopack, Kaison, and Oonam; (2) Pekoe sorts—viz., Plain Orange, Foo-chow, Scented Orange, Canton Scented Orange, and Flowery Pekoe, Oolong, and Souchong. *Assam:* Congo, Orange Pekoe, and Souchong. *Java:* Congo and Imperial. The latter is made up into little balls about the size of a pea, and is rather rare.

The use of the infusion of the leaves of tea as a beverage is general in the south-eastern parts of Asia, and has become prevalent also amongst the British—at home, and in all their colonies—the Americans, and the Dutch. In Scandinavia, tea is also much used by all who can afford it. In other parts of Europe, the use of tea is much less general, and is chiefly confined to maritime districts, towns, and the wealthy. The importation of tea overland through Russia is inconsiderable, and the sea trade is chiefly to Britain and North America.

The *substitutes* for tea, in countries where it is difficult to obtain it, are of two sorts: those which contain theine, and which consequently have the same stimulating effect; and those which are destitute of that principle, and only resemble the true tea in flavour or smell, or which possess some other stimulating principle. Of the former class are—(1) Maté (q. v.): (2) Guarana (q. v.); so rich is this material in theine that it has lately been used in Great Britain for obtaining that principle; and it has been introduced into Austria and France as a powerful medicine: (3) Coffee-leaves, which are occasionally prepared as a substitute in the West Indies; they would be more generally used were it not for the disagreeable smell of the infusion; (4) the Kola-nut, the active principle of which has quite recently been ascertained to be theine.*

The second class, or those which do not possess that principle, are very numerous; but only a few can be said to be of any importance from being in general use in the countries producing them. These are the Siberian tea—leaves of *Saxifraga crassifolia;* the Appalachian tea—leaves of *Prinos glabra;* the Labrador tea—leaves of *Ledum buxifolium;* the Chilian tea—leaves of *Eugenia ugni;* Trinidad pimento tea—leaves of *Eugenia pimenta;* and the leaves of the Partridge-berry, which are used in some parts of North America. The Faham tea of Mauritius, and a great many more, should be regarded in the light of medicines, rather than as ordinary beverages; although they are generally classed with the substitutes for ordinary tea.

Tea, in its Chemical, Physiological, and Medicinal Relations.—On submitting the ordinary com-

* Dr Daniell's observations on the kola-nut (published since the article COLA-NUT appeared) are of such importance as to demand a notice here. From time immemorial, the seeds of the kola-nut have been held in inestimable value as a luxury by the inhabitants of the vast tract between the west coast and the region of Central Africa known as Sudan; and the trade in these nuts has extended to various markets on the Mediterranean. The Portuguese, Dutch, and subsequently the English voyagers, fell into the negro predilections for this fruit; and eventually the due gratification of this want became a matter of imperative necessity. Dr Daniell's knowledge of the tonic and astringent properties of these nuts was gained during his residence on the Gold Coast, where the white inhabitants were in the habit of taking a decoction of the fresh nuts, with apparent benefit, in a particular form of endemic diarrhœa, arising more from local relaxation of the mucous membranes than from constitutional debility. On taking the medicine late, two evenings in succession, when he was afterwards suffering from an attack of this kind in Jamaica, he found that he was deprived of sleep during the remainder of the night. On intermitting the decoction, the natural rest returned. and on returning to it, the insomnia again occurred. Hence, he was led to suspect that a substance analogous to theine must be present; and a chemical analysis of the nuts yielded crystals in all respects resembling those of theine, and subsequently proved by the more careful investigations of Dr Atfield to be composed of that alkaloid. Wherever the slave-trade prevailed, the tree yielding the kola-nut (*Cola acuminata* of Robert Brown) followed as a matter of necessity, being imported and cultivated for the benefit of the negro. It was thus introduced into the Mauritius, Jamaica and other West India Islands, Brazil, Mexico, &c. It was specially intended to act in warding off the predisposition to epidemic outbreaks of suicidal mania which not unfrequently almost depopulated considerable districts. While Dr Daniell's experiments disprove the statement (contained in the article COLA-NUT) that these seeds render bad water palatable, his investigations, confirmed as they are by Dr Atfield's chemical analysis, shew, that whatever may be their food-value (which Dr Daniell estimates higher, from his observations, than Dr Atfield from their analysis), they may be advantageously substituted for coffee. See the papers by Dr Daniell, 'On the Kola-nut of Tropical West Africa,' and by Dr Atfield, 'On the Food-value of the Kola-nut,' in the *Pharmaceutical Journal* for March 1865.

mercial tea * to analysis, we find that it contains (1) a volatile or essential oil; (2) theine or caffeine, described in this work under the latter name; (3) a nitrogenous compound analogous to caseine or gluten; (4) a modification of tannin; besides gum, sugar, starch, fat, woody fibre, salts, &c. *The volatile oil* gives to tea its peculiar aroma and flavour. The proportion in which it exists is, according to Miller, about 0·79 per cent. in green, and 0·6 per cent. in black tea. It may be obtained by distilling the tea with water, and is found to exert a most powerfully stimulating and intoxicating effect. In China, tea is seldom used till it is a year old, on account of the well-known intoxicating effects of new tea, due probably to the larger proportion of essential oil which it usually contains. The headache and giddiness of which tea-tasters complain, and the attacks of paralysis to which, after a few years, persons employed in packing tea are found to be liable, are due to the action of this oil, which, according to Johnston, 'does not exist in the natural leaf, but is produced during the process of drying and roasting.'—*Chemistry of Common Life*, 1855, vol. i. p. 170.

The theine or *caffeine*, an alkaloid of weak basic properties, varies considerably in different kinds of tea. Peligot found it to range from 2·2 to 4·1 per cent. in ordinary green teas, while very rarely it amounted to 6 per cent.; whereas from the researches of Stenhouse it appears that not more than 2 per cent. is usually contained in the ordinary teas in the English market. It may readily be obtained by the following simple experiment. When dry finely-powdered tea-leaves, or a dried watery extract of the leaves, are put on a watch-glass covered with a paper cone, and the whole is placed upon a hot plate, or exposed to the heat of a spirit-lamp, a white vapour gradually rises and condenses on the interior of the cone, in the form of small crystals, which consist of theine. As it has no odour, and only a slightly bitter taste, it obviously has little to do with the taste or flavour of the tea from which it is extracted; it is, however, to the presence of this ingredient that the peculiar physiological action of tea on the animal economy is due. This substance is represented by the formula $C_8H_{10}N_4O_2$, and is remarkable for the large quantity of nitrogen (28·83 per cent.) which it contains; and which is nearly double the amount contained in albumen, fibrine, &c. It is also remarkable as occurring in plants very unlike each other, and growing in remote countries, which have by instinct been selected by different nations for the purpose of yielding a slightly exciting and very refreshing beverage (see above). From numerous experiments, it appears that the introduction into the stomach of a small quantity of theine (such as three or four grains, which is the quantity contained in about one-third of an ounce of good tea) has the remarkable effect of diminishing the daily waste or disintegration of the bodily tissues, which may be measured by the amount of solid constituents contained in the urinary secretion. And if the waste be lessened, the necessity for food to repair that waste will obviously be diminished in an equal proportion. 'In other words,' says Professor Johnston, 'by the consumption of a certain quantity of tea, the health and strength of the body will be maintained in an equal degree upon a smaller supply of ordinary food. Tea therefore saves food—stands to a certain extent in the place of food—while at the same time it soothes the body, and enlivens the mind.'—*Op. cit.*, p. 173. It should, however, be stated, that the generally accepted view, that theine checks the destruction of the tissues, has been recently called in question by an excellent experimental observer, Dr Edward Smith, in various Memoirs published in the *Philosophical Transactions* and elsewhere. If double the above quantity of theine (or of the tea containing it) be taken, there is a general excitement of the circulation, the heart beating more strongly, and the pulse becoming more rapid; tremblings also come on, and there is a constant desire to relieve the bladder. At the same time, the imagination is excited, the mind begins to wander, visions appear, and a peculiar kind of intoxication comes on; the symptoms finally terminating, after a prolonged vigil, in a sleep arising from exhaustion. It is not definitely known what changes theine undergoes in the animal economy, but when oxidised artificially, it becomes decomposed into methylamine or methylia ($CH_3.H_2.N$), hydrocyanic acid (CNH), and amalic acid ($C_4(CH_3)^4N_4O_7 + H_2O$). The *nitrogenous compound* allied to caseine or gluten constitutes about 15 per cent. of the weight of the leaf. As hot water extracts very little of this substance, a large quantity of this nutritious matter, which forms about 28 per cent. of the dried spent leaves, is thrown away. Much of it might be dissolved if a little carbonate of soda were added to the boiling water with which the tea is made; and in the brick-tea (the refuse and decayed leaves and twigs, pressed into moulds) used by the Tartars, most of this substance is utilised. They reduce the tea to powder, and boil it with the alkaline water of the steppes, to which salt and fat have been added, and of this decoction they drink from 20 to 40 cups a day, mixing it first with milk, butter, and a little roasted meal. But without the meal, mixed only with a little milk, they can subsist for weeks on this thin fluid food. To the *astringent principle*, or *tannin*, which forms from 13 to 18 per cent. of the dried leaf, tea owes its astringent taste, its constipating effect upon the bowels, and its property of communicating an ink-like colour to water containing salts of iron. Whether this ingredient contributes in any degree to the exhilarating, satisfying, or narcotic action of tea, is not known. Professor Johnston thinks it probable that it does exert an exhilarating effect, from the fact, that a species of tannin is the principal ingredient of the Indian betel-nut, which, when chewed, produces a mild and agreeable form of intoxication.

It is usual to judge of the quality of a tea by its aroma, and by the flavour and colour of the infusion which it yields; but to these tests should be added the determination of the amount of soluble matter which it readily yields to boiling water. It is stated by Miller that our ordinary tea contains about 45 per cent. of soluble matter; but the independent researches of Davy and Peligot shew that boiling water seldom extracts more than one-third of the weight of the dry tea; while in J. Lehmann's experiments, only one-sixth (15·5 per cent.) was extracted. Good tea should, moreover, not yield more than 5

* The following comparative analyses of tea, coffee, and the dry kola-nut are interesting, as shewing how nearly they contain the same organic constituents, although in different proportions:

	100 Parts of Tea contain	100 Parts of Coffee contain	100 Parts of Kola-nuts contain
Water,	5	12	13·65
Theine,	3	1·75	2·13
Caseine,	15	13	6·33
Gum,	18	9	10·67
Sugar,	3	6·5	
Starch,	a trace	a trace	42·00
Tannin,	26·25	4	...
Aromatic oil,	0·75	0·002	1·52
Fat,	4	12	
Fibre,	20	35	20·00
Mineral substances	5	6·7	3·20

or 6 per cent. of ash when incinerated; and a portion of this is probably due to the colouring matter which the Chinese add to the green teas prepared for the foreign market. For this purpose, they used to employ a mixture of Prussian blue and gypsum, but indigo is now commonly used, which is probably harmless. Drinkers of green tea who wish to know which of these adulterations they are swallowing, may easily determine the point by the following simple experiment. 'If a portion of the tea be shaken with cold water, and thrown upon a bit of thin muslin, the fine colouring matter will pass through the muslin, and settle to the bottom of the water. When the water is poured off, the blue matter may be treated with chlorine, or a solution of chloride of lime. If it is bleached, it is indigo; if potash makes it brown, and afterwards a few drops of sulphuric acid make it blue again, it is Prussian blue.'—Johnston, *op. cit.*, p. 181, *note*.

Much has been written regarding the dietetic and medical uses of tea. While some physicians have over-praised its value, others have regarded it as the source of numerous diseases, especially of the nervous system. In his admirable work on *Hygiene*, Dr Parkes remarks that 'tea seems to have a decidedly stimulative and restorative action on the nervous system, which is perhaps aided by the warmth of the infusion. No depression follows this. The pulse is a little quickened. The amount of pulmonary carbonic acid is, according to Dr E. Smith, increased. The action of the skin is increased; that of the bowels lessened. The kidney excretion is little affected; perhaps the urea is a little lessened, but this is uncertain, the evidence with regard to the urine being very contradictory.' Dr E. Smith considers that 'tea promotes all vital actions.' Dr Parkes regards it as a most useful article of diet for soldiers, and it is well known that cold tea is now frequently preferred to beer or cider by reapers and other labourers engaged in laborious work in hot weather. As a general rule, tea is very prejudicial to young children, and is not a suitable drink till growth is completed; and adults of an irritable constitution, or a leucophlegmatic temperament, often suffer from its use. Those with whom tea does not agree, will generally find cocoa the best substitute. Old and infirm persons usually derive more benefit and personal comfort from tea than from any other corresponding beverage. In fevers, tea, in the form of a cold weak infusion, is often of great service. In persons of a gouty and rheumatic tendency, and especially in such as are of the *Lithic Acid Diathesis* (q. v.), weak tea, taken without sugar, and with very little milk, is the best form of ordinary drink. In some forms of diseased heart, tea proves a useful sedative, while in other cases it is positively injurious; and a cup of strong green tea, especially if taken without sugar or milk, will often remove a severe nervous headache. It is nearly as powerful an antidote in cases of opium-poisoning as coffee; and very strong tea has been the means of preserving life, in cases of poisoning by tartar emetic, the tannin being in these cases the active agent. It is impossible to speak too strongly against the habit occasionally adopted by students of keeping off their natural sleep by the frequent use of strong tea. The persistent adoption of such a habit is certain to lead to the utter destruction of both bodily and mental vigour.

TEAK, the name of two kinds of timber, valuable for ship-building and other purposes, one of which is known as INDIAN T., and the other as AFRICAN TEAK. The trees which produce them belong to very different orders. INDIAN T. (*Tectona grandis*) is a tree of the natural order *Verbenaceæ*. It is found in the mountainous parts of Malabar, and elsewhere in Hindustan, and in the Eastern Peninsula, Ceylon, Java, &c. It has been introduced in some parts of India, in which it is not indigenous. Dr Roxburgh introduced it in the low grounds of the Circars as early as 1790. It has been planted in some parts of Ceylon, but not yet with much result, as it takes 60 or 80 years to grow to a large size. It is a beautiful tree, attaining a height sometimes even of 200 feet, and rising above all the other trees of the East Indian forests. It has deciduous oval leaves of 12—24 inches long, covered with rough points; great panicles of white flowers, with 5—6-cleft corolla, and 4-celled drupes about the size of a hazel-nut. Its flowers are used medicinally in cases of retention of urine, and its leaves by the Malays in cholera. Silk and cotton stuffs are dyed purple by the leaves. The timber is the most valuable produced in the East Indies; it is light and easily worked, strong, durable, and not liable to the attacks of insects. It abounds in silex, and resembles coarse mahogany. It is extensively used for ship-building, for which purpose it is imported into Britain. All the finest ships built in India, and many built in England, are of teak. The most extensive T. forests are in Pegu. The T. generally rather grows in clumps in forests than forms forests of itself.—AFRICAN T., sometimes called AFRICAN OAK, is a timber similar to East Indian teak. It is now believed to be the produce of *Oldfieldia Africana*, a tree of the natural order *Euphorbiaceæ;* but the leaves of many different trees have been brought to botanists as those of the African teak.

Indian Teak (*Tectona grandis*).

TEAL (*Querquedula*), a genus of ducks (*Anatidæ*) with very slightly lobed hind-toe, narrow bill, as long as the head, the sides nearly parallel, or widening a little at the end, the wings pointed, the tail moderately large, and wedge-shaped. Some naturalists divide the genus into two—*Nettion*, in which the bill has parallel sides, and a small nail at the tip; and *Querquedula*, in which it is widened, and has a larger nail. The species are numerous, the smallest of the ducks, and widely distributed over the world. They generally frequent rivers and lakes, feeding principally at night on aquatic insects, worms, molluscs, seeds, &c. The COMMON T. (*Q. or N. crecca*) is plentiful in Britain and in most parts of Europe. It is occasionally but rarely seen in North America. Its whole length is about 14 inches. It is a very beautiful bird; the head of the male brownish red, the body transversely undulated with dusky lines, a white line above, and another beneath the eye, the speculum black and green. It makes its nest on the margins of lakes or rivers, of decayed vegetable matter lined with down, and lays eight or ten eggs. Its flesh is extremely delicate. It was domesticated by the ancient

Romans, and seems capable of being advantageously introduced into our poultry-yards.—The GARGANEY (q. v.) is another British species.—The GREEN-WINGED T. (*Q.* or *N. Carolinensis*) of North America is very similar to the Common T., but it is

Common Teal (*Querquedula crecca*), male and female.

at once distinguished by a white crescent in front of the bend of the wings. It is occasionally seen in Europe. In its summer migrations, it visits very northern regions.—The BLUE-WINGED T. (*Q. discors*) is very abundant in many parts of North America. It is rather larger than the Common Teal. It is easily domesticated.

TEAR-PITS. See DEER.

TEA′SEL (*Dipsacus*), a genus of plants of the natural order *Dipsaceæ* or *Dipsacaceæ.* This order consists of herbaceous and half-shrubby exogenous plants, with opposite or whorled leaves, and flowers in heads or whorls, surrounded by a many-leaved involucre. About 150 species are known, natives of the temperate parts of the Old World. In the

Fuller's Teasel (*Dipsacus fullonum*).

genus *Dipsacus*, the flowers are separated from each other by long, stiff, prickle-pointed bracts. The only valuable species of the order is the FULLER'S T., or CLOTHIER'S T. (*D. fullonum*), a native of the south of Europe, naturalised in some parts of America. It is a biennial, several feet high with sessile serrated leaves, the stem and leaves prickly; and with cylindrical heads of pale or white flowers, between which are oblong, acuminated, rigid bracts, hooked at the point. The heads are cut off when the plant is in flower, and are used in woollen factories, and by fullers and stocking-makers, for raising the nap on cloth. No mechanical contrivance has yet been found to equal T. for this purpose; to which the hooked points, the rigidity, and the elasticity of the bracts are admirably adapted. The heads of T. are fixed on the circumference of a wheel or cylinder, which is made to revolve against the surface of the cloth. T. is cultivated in many parts of Europe, and is imported into Britain from Holland and France. It is cultivated to some extent in England, particularly in Somersetshire and Yorkshire. The seed is sown in March, on well-prepared strong rich land, and the plants thinned out to a foot apart. In August of the second year, the heads are ready to be cut. They are packed in bundles of 25 each, and about 160 such bundles are the usual produce of an acre. The flowers of T. abound in honey, and the seeds are used for feeding poultry.

TECHNICAL EDUCATION. See SUPP. in Vol. X.

TECHNO′LOGY (Gr. *techne*, art) is the name given to the science or systematic knowledge of the industrial arts. In its widest sense, it would embrace the whole field of industry, but it is restricted in usage to the more important manufactures (spinning, weaving, metallurgy, brewing, &c.). Technology is not an independent science, having a set of doctrines of its own, but consists of applications of the principles established in the various physical sciences (chemistry, mechanics, mineralogy, &c.) to manufacturing processes. A complete course of instruction in technology could only be of the most superficial kind. The essential preparation for any branch of the manufacturing arts is the study of the fundamental physical sciences which are taught in schools and universities; and the special applications to the branch which the student has to pursue professionally can best be learned from special treatises on the subject in connection with practice in a manufacturing establishment. A general knowledge, however, of the arts of manufacture is interesting and instructive to all, and hence the museums of industry recently established by the British government, and yet in their infancy, promise to be of great benefit to the public in general, as well as to the professional manufacturer.

TECTIBRANCHIA′TA, an order of gasteropodous molluscs, having the gills arranged only on one side, resembling pinnatifid leaves, and covered by the mantle and a small shell. The T. feed mostly on sea-weeds, but some of them also eat animal substances. To this order belongs the SEA-HARE of the Mediterranean (*Aplysia depilans*), which is sometimes a foot in length, and was in former times an object of superstitious dread, on account of its grotesque form, and of a violet-coloured fluid which it ejects from the inner surface of the mantle when molested, and which was supposed to be poisonous.

TE DEUM (*Te Deum laudamus, Te Dominum confitemur*), a well-known hymn (so called from its first words) of the Roman Catholic Church, sung on all occasions of triumph and thanksgiving, and a theme upon which the most celebrated composers have from time immemorial exercised their musical genius. The hymn is one of the most simple, and at the same time the most solemn and majestic in the whole range of the hymnology of the Roman Catholic Church. Its authorship is uncertain. An ancient chronicle (long posterior, however, to the supposed date of the composition of this hymn, and

otherwise destitute of authority) describes the Te Deum as the joint production of Sts Ambrose and Augustine, into which they both burst forth by a common inspiration on occasion of the baptism of Augustine. From this supposed origin, the Te Deum is commonly called the Ambrosian Hymn. It is ascribed by other authorities to Hilary of Poitiers, but is most probably considerably later. Besides its general use on occasions of joyous celebrations, the Te Deum forms part of the daily 'Matins' of the Roman Breviary, and is recited at the end of 'Matins' on all festivals, and on all Sundays except those of Advent and Lent, to which, as being seasons of penance, the Te Deum is considered inappropriate. Its use is very ancient. It is universally admired by Protestants as well as Roman Catholics, and exhibits none of the peculiarities of Roman Catholic theology.

TEEL-SEED. See OILS and RAM-TIL.

TEES, a river in the north of England, is 90 miles long, flows east, forming the boundary between the counties of Durham (q. v.) and York (q. v.), and falls into the North Sea, ten miles below Stockton, to which town it is navigable for vessels of 60 tons burden.

TEETH, THE. A tooth is described by Professor Owen, the highest authority on this subject, as 'a hard body attached to the mouth or commencement of the alimentary canal, partially exposed when developed. Calcified teeth are peculiar to the vertebrates, and may be defined as bodies primarily, if not permanently, distinct from the skeleton, consisting of a cellular and tubular basis of animal matter containing earthy particles, a fluid, and a vascular pulp.'—*The Anatomy of Vertebrates*, 1866, vol. i. p. 359. 'They present,' says the same writer, 'many varieties as to number, size, form, structure, position, and mode of attachment, but are principally adapted for seizing, tearing, dividing, pounding, or grinding the food.* In some species, they are modified to serve as formidable weapons of offence and defence; in others, as aids in locomotion, means of anchorage, instruments for uprooting or cutting down trees, or for transport and working of building materials. They are characteristic of age and sex; and in man they have secondary relations, subservient to beauty and to speech. Teeth are always intimately related to the food and habits of the animal, and are therefore highly interesting to the physiologist; they form, for the same reason, important guides to the naturalist in the classification of animals.'—*Circle of the Sciences; Organic Nature*, vol. i. p. 264.

True teeth consist of one, two, or more tissues, differing in their chemical composition and in their microscopical appearances. 'Dentine,' which forms the body of the tooth, and 'cement,' which forms its outer crust, are always present; the third tissue, the 'enamel,' when present, being situated between the dentine and cement. The *dentine*, which is divided by Professor Owen into hard or true dentine, vaso-dentine, and osteo-dentine, consists, according to that physiologist, of an organised animal basis, disposed in the form of extremely minute tubes and cells, and of earthy particles; these earthy or calcareous particles being either blended with the animal matter of the interspaces and walls of the tubes and cells, or contained in a minutely divided state in their cavities. The tubes and cells contain, besides the calcareous particles, a colourless fluid, which is probably transuded blood plasma, or *liquor sanguinis*, and contributes to the nutrition of the dentine. In hard or true dentine, the *dentinal tubes* proceed from the hollow of the tooth known as the *pulp cavity*, in a slightly wavy course, nearly at right angles to the outer surface (see fig. 1). 'The hard substance of the tooth is thus arranged in hollow columns, perpendicular to the plane of pressure, and a certain elasticity results from these curves; they are upright where the grinding surface of the crown receives the appulse of the opposing tooth, and are horizontal where they have to resist the pressure of contiguous teeth. The tubuli, besides fulfilling the mechanical ends above stated, receive the plasma transuded from the remains of the vascular pulp, which circulates by anastomosing branches of the tubuli through the dentine, maintaining a sufficient, though languid vitality of the system. The delicate nerve-branches on the pulp's surface, some minute production of which may penetrate the tubuli, convey sensations of impressions affecting the dentine—sensations of which every one has experienced the acuteness, when decay has affected the dentine, or when mechanical or chemical stimuli have "set the tooth on edge;" but true dentine has no canals large enough to admit capillary vessels with the red particles of blood.' When a part of the primitive vascular pulp from which the dentine is developed, remains permanently uncalcified, red blood is carried by 'vascular canals' into the substance of the tissue. Such dentine is called *vaso-dentine*, and is often combined with true dentine in the same tooth, as, for example, in the large incisors of certain rodents, the tusks of the elephant, and the molars of the extinct megatherium. Another modification of the dentine is when the cellular basis is arranged in concentric layers around the vascular canals, and contains 'radiated cells,' like those of bone: this is termed *osteo-dentine*, and resembles true bone very closely. The *cement* always corresponds in texture with the osseous tissue of the same animal, and wherever it occurs in sufficient thickness, as on the teeth of the horse or ox, it is traversed like bone by vascular canals. Moreover, when the osseous tissue contains minute radiated cells, precisely similar cells are likewise present in the canal, and constitute its most marked characteristic. The relative densities of dentine and cement vary according to the amount of earthy matter. In the complex grinders of the elephant and some other animals, the cement, which forms nearly half the mass of the tooth, wears down sooner than the dentine. The *enamel* is the hardest of all the animal tissues, and contains no less than 96·4 per cent. of earthy matter (mainly phosphate of lime), while dentine contains only 72 per cent., and cement and ordinary bone only 69 per cent. of earthy matter. The earthy matter is contained in

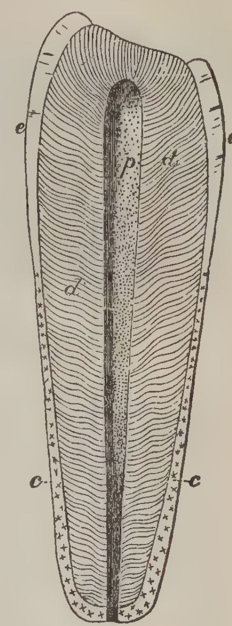


Fig. 1.—Section of Human Incisor Tooth, magnified.
c, c, the cement; *d, d*, the dentine; *e, e*, the enamel, partly chipped off on the crown; *p*, the pulp-cavity.

* Hence the division of the teeth into incisors, or cutting teeth; molars, or grinding teeth; &c.

comparatively wide canals, composed of animal membrane of extreme tenuity.

In tracing the teeth upwards from their simplest

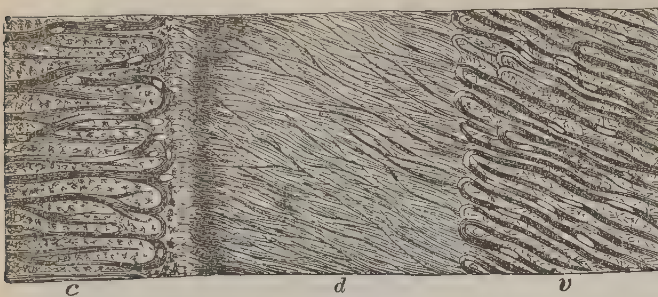


Fig. 2.—Magnified Section of a Molar Tooth of the Megatherium.
v, vaso-dentine; *d*, dentine; *c*, cement.

to their most complicated forms, we find a very few examples (solely among fishes—as, for example, the wrasse), in which teeth consist of a single tissue—a very hard kind of non-vascular dentine. Teeth consisting of dentine and vaso-dentine are very common in fishes, the hard dentine being external, and performing the office of enamel. Dentine and cement, the latter forming a thick outer layer, constitute the grinding teeth of the dugong. In the teeth of the sloth, the hard dentine is reduced to a thin layer, and the chief bulk of the tooth consists of vaso-dentine internally, and a thick crust of cement externally. 'The human teeth and those of the carnivorous mammals appear at first sight to be composed of dentine and enamel only; but their crowns are originally, and their fangs are always covered by a thin coat of cement. There is also commonly a small central tract of osteo-dentine in old teeth. The teeth called compound or complex in *Mammalia* differ as regards their composition from the preceding only by the different proportion and disposition of the constituent tissues. Fig. 3 is a longitudinal section of the incisor of a horse; *d* is the dentine, *e*, the enamel, and *c*, the cement, a layer of which is reflected into the deep central depression of the crown; *s* indicates the coloured mass of tartar and particles of food which fills up the cavity, forming the "mark" of the horse-dealer.'—*Organic Nature*, vol. i. p. 267. Far more complex forms of teeth than this may be produced by peculiar arrangements, chiefly inflections, of the tissues. Certain fishes, and a family of gigantic extinct batrachians, to which Owen has, from this remarkable peculiarity, given the name *Labyrinthodons* (q. v.), exhibit this kind of complexity in a remarkable degree. Another kind of complication is produced by an aggregation of many simple teeth into a single mass. These compound teeth are most

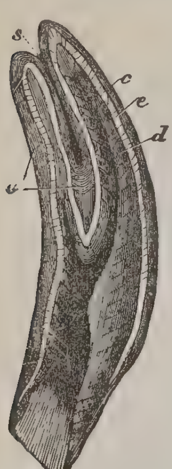


Fig. 3.—Longitudinal Section of the Incisor of a Horse.

common in fishes, but are occasionally met with in mammals. The teeth of the Cape ant-eater (*Orycteropus*), depicted and described by Owen in *The Circle of the Sciences*, are of this kind, each tooth being composed of a congeries of long and slender prismatic denticles of dentine, which are cemented together. In the elephant, the compound molars belong to this class, the denticles being in the form of plates vertical to the grinding surface, and transverse to the long diameter of the tooth. When the tooth is bisected vertically and longitudinally, the three substances, dentine, *d*, cement, *c*, and enamel, *e*, are seen blended together (see fig. 4).

Our limited space forbids our entering into any details regarding the teeth of *fishes*, further than to remark, that, in regard to their number, form, substance, structure, situation, or mode of attachment, they offer a greater and more striking series of varieties than do those of any other class of animals.

Fig. 4.—Longitudinal Section of part of an Elephant's Grinder.
c, the cement; *d*, the dentine; *e*, the enamel; *p*, the common pulp-cavity; *r*, one of the roots of this complex tooth.

In all fishes, the teeth are shed and renewed, not once only, as in mammals, but frequently during the whole course of their lives; and, as Professor Owen observes, 'this endless succession and decadence of the teeth, together with the vast numbers in which they often co-exist in the same fish, illustrate the law of vegetation or irrelative repetition, as it manifests itself on the first introduction of new organs in the animal kingdom.' While comparatively few fishes are entirely devoid of teeth, we find that in the class of *Reptiles*, the whole order of *Chelonia* (tortoises and turtles), the family of toads (*Bufonidæ* in the order *Batrachia*), and certain extinct genera of *Sauria* (lizards), are toothless. Frogs have teeth in the upper, but not in the lower jaw. Newts and salamanders have teeth in both jaws and upon the palate; and teeth are found on the palate as well as on the jaws of most serpents,

In most lizards, and in crocodiles, the teeth are confined to the jaws. The teeth in reptiles are for the most part simple, of a conical form, and adapted, as in the case of most fishes, for seizing and holding, but not for dividing or masticating the food. In no reptile does the base of the tooth branch into fangs; and, as a general rule, the base of the tooth is anchylosed to the bone which supports it. The completion of a tooth is soon followed by preparation for its removal and succession, the faculty of developing new tooth-germs being apparently unlimited in this class. For further details regarding the teeth of fishes and reptiles, the reader is referred to Professor Owen's invaluable *Anatomy of the Vertebrates*, 1866, vol. i. pp. 359—409. Birds having no teeth, we proceed to the consideration of the dental system of *mammals*—a class which includes a few genera and species that are devoid of teeth. The true Ant-eaters (*Myrmecophaga*), the Pangolins or Scaly Ant-eaters (*Manis*), and the Spiny Monotrematous Ant-eater (*Echidna*), are strictly toothless. The Ornithorhynchus has horny teeth, and the Whales (*Balæna* and *Balænoptera*) have transitory teeth, succeeded in the upper jaw by whalebone. The female Narwhal exhibits nothing more than the germs of two teeth in the substance of the upper jaw; in the male, one of these germs becomes developed into the remarkable weapon which specially characterises the animal, and to which its generic term, *Monodon* (single tooth), is due. In the Great Bottle-nose Whale, in the adult state, there are only two teeth (here occurring in the lower jaw); whence the name *Hyperoödon bidens*. The Elephant has never more than one entire molar, or parts of two, in use on each side of the upper and lower jaws; to which are added two tusks, which are modified incisors, more or less developed, in the upper jaw. Some rodents have 2 grinders on each side of both jaws, which, added to the 4 cutting-teeth in front, make 12 in all; but the common number of teeth in this order is 20, although Hares and Rabbits have 28 each. The number of teeth, 32, which characterises man, the apes of the old world, and the true ruminants, is the average one of the class Mammalia; but according to Professor Owen, 'the typical number is 44.' 'I have been led,' he observes, 'chiefly by the state of the dentition in most of the early forms of both carnivorous and herbivorous mammalia which flourished during the eocene tertiary periods, to regard 3 incisors, 1 canine, and 7 succeeding teeth, on each side of both jaws, as the type-formula of diphyodont * dentition.'—*On the Classification and Geographical Distribution of the Mammalia*, 1859, p. 18. A few of the Monophyodonts possess from 80 to 100 teeth. See the article MAMMALIA. The hog, the mole, the gymnure, and the opossum, are among the few existing quadrupeds which retain the typical number and kinds of teeth. The formula expressing the number of the different kinds of teeth—viz., the incisors or cutting-teeth, the canines or dog-teeth, the premolars, and the molars or true grinders, commonly known as the *dental formula*, is described in the article DENTITION, in which the *milk* or *deciduous* teeth, and the order in which they appear, are also described. It is only in the Mammals that we have a well-marked division of the teeth into the four kinds of incisors, canines, premolars, and molars, each of which claims a brief description.

The *incisors*, or cutting-teeth, are situated in front, and possess a single conical root or fang, and a vertical crown bevelled behind, so as to terminate in a sharp cutting edge. These teeth are specially fitted, as their name implies, for cutting the food. In man, there are two of these incisors in each side of each jaw. In herbivorous animals, they crop the herbage; in rodents (the rabbit, hare, rat, beaver, &c.), these teeth are very much developed, and differ from any other teeth occurring in Mammals in this respect, that their growth continues throughout life; and if their length does not constantly increase, it is because their free extremity or edge is worn down by trituration as fast as they grow at the base from their roots.

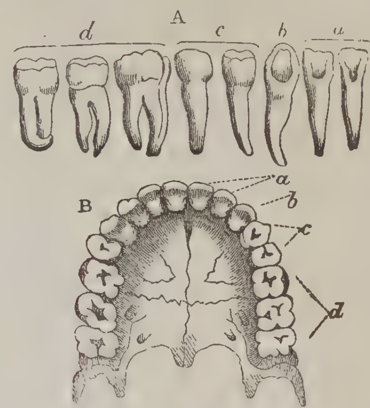


Fig. 5.

A, the separate human teeth as they occur in the half-jaw of the adult; B, the human teeth *in situ* in the upper jaw; *a*, *a*, incisors; *b*, *b*, canine; *c*, *c*, premolars; *d*, *d*, true molars.

The *canines* (so called from their prominence in the dog) come next to the incisors. Their crown is rather conical than wedge-shaped, and their fang sinks more deeply into the jaw than in the case of the incisors. In all carnivorous animals, they are largely developed, being obviously formed for tearing the flesh of their prey. In man, there is one canine tooth in each half-jaw; and there is never more than this number in any of the lower animals.

The *premolars* (known also as bicuspids and false molars) come next in order to the canines; they are smaller than the latter, and their crown presents two pyramidal eminences. In man, there are two premolars in each half-jaw. Their function more nearly approaches to that of the true molars behind them, than to that of the canines.

The *true molars* (or multicuspids) are placed most posteriorly. They are remarkable for their comparatively great size, the square form of the upper surface, on which are from three to five elevations or cusps, and for their short root, which is divided into from two to five branches, each of which is perforated at its extremity. In man, there are three molars in each half-jaw, the posterior one being termed the wisdom-tooth, from its being cut the latest: they are especially employed for grinding the food, under the action of the muscles of the lower jaw.

The teeth are so admirably adapted for the special purposes which they are called upon to fulfil, that it is generally easy, from a careful examination of them, to say to what class of animals they

* Professor Owen divides the class Mammalia, in regard to the times of formation and the succession of their teeth, into the *Monophyodonts* (Gr. *mono-*, once; *phy-*, generate; and *odont*, tooth), or those that generate a single set of teeth, as the sperm whales, dolphins, porpoises, armadillos, and sloths; and the *Diphyodonts* (derived from *di*, twice, &c.), or those that generate two sets of teeth, as the Mammals generally, with the above exceptions.

belong, and to draw various conclusions regarding the habits and structure of the class generally. Thus, in carnivorous animals, the molars are not grinding-teeth, but present sharp cutting edges, and those of the upper and lower jaw overlap each other; resembling a pair of scissors in their action. In insectivorous animals, the molars have a tuberculated surface, with conical points and depressions, so arranged as to lock into each other. In frugivorous animals, living on soft fruits, these teeth are provided with rounded tubercles, while in herbivorous animals, they have a broad, rough surface, resembling a millstone.

There is also a close connection between the articulation or joint of the lower jaw and the nature of the food used by the animal. Thus, in purely carnivorous animals, in which the teeth simply tear and cut the food, no grinding motion is required, and the jaw is capable only of a simple hinge-motion in the vertical plane; while in herbivorous animals, the joint is so constructed as to allow of extensive sliding and lateral motion of the lower molar teeth upon the upper. In man, both the form of this articulation and the general character of the teeth, point to an intermediate position in relation to food, and form a good physiological argument for the mixed diet which general custom has decided to be most favourable and natural to our species.—For further information on this subject, the reader is referred, not only to the three works of the professor from which quotations have been made in this article, but to his splendid *Odontography* (1844), and to his article 'Teeth,' in *The Cyclopædia of Anatomy and Physiology;* to F. Cuvier, *Sur les Dents*, &c.; and to De Blainville's *Osteographie.*

Diseases of the Teeth.—The dangers to which infants and children are exposed during the process of teething, are noticed in the article Dentition; and we shall therefore here confine our remarks to the affections of the permanent teeth, of which the following are the most important:

1. *Caries of the teeth* usually commences in the dentine immediately below the enamel, a yellow or brown spot being observed on the surface of the tooth over the affected part. The tissue soon becomes softened, and a small cavity is formed, which, after a time, presents an external opening, in consequence of the unsupported enamel giving way. The substance of the tooth now decays more rapidly, and the caries gradually approaches the central or pulp cavity, which at length is opened. Hitherto, there has been little or no suffering, but now pain is experienced under the action of irritant substances, heat, cold, &c. Inflammation proceeding to suppuration takes place; the pulp is gradually destroyed by ulceration; and the body of the tooth, thus deprived of its nourishment, decays, and leaves nothing but the outer coating of enamel, which then breaks away by degrees, till nothing but the fangs of the tooth remain, and these usually cease to give pain. Caries is not only a common cause of toothache, but frequently gives rise to obstinate headache, pain in the ear, deafness, squinting, impossibility of bearing the light (photophobia), and other anomalous symptoms, which immediately disappear upon the removal of the diseased tooth. In these cases, the tooth may never have ached, but will be found painful when pressed up or smartly struck. The primary cause of caries is constitutional, and it especially occurs in scrofulous and ill-nourished persons, or in those whose health is broken down by too frequent pregnancies, prolonged lactation, the abuse of mercury, &c. The direct or exciting causes are usually described as: (1) Such as destroy the integrity of the enamel, and thereby expose the dentine to the influence of irritant substances; or (2) such as operate upon the vital susceptibilities of the dental tissues. Among the former are acids and other corrosive substances taken into the mouth, sour eructations, the attrition of opposing surfaces of the teeth, and all kinds of mechanical violence; while among the latter may be mentioned hot and cold drinks, especially when taken in quick alternation. The excessive use of sugar is also commonly regarded as a cause of the disease. Many of the best dentists, however, deny that acids (when taken medicinally) or the abrasion of the enamel can give rise to caries.

With regard to treatment, it may be observed, that if the caries be slight and recent, the decayed portion must be removed, and the cavity filled up with gold, as described in the article Dentistry. 'But,' says Dr Druitt, who on dental matters always quotes the opinions of Mr Tomes, the most scientific living authority on the diseases of the teeth, 'if the decay has advanced far towards the pulp-cavity, or has laid that open, it may be necessary first to employ aperients and tonics, and use some application to deaden the sensibility of the tooth, so as to enable it to bear the stopping, and to protect it meanwhile from contact with food and saliva.' Many a useless visit to the dentist might be avoided, if the patient would take an aperient dose of Epsom salts two or three consecutive mornings; and after cleansing out the cavity with dry cotton-wool, would insert twice a day a plug of that substance, moistened in Eau de Cologne, or, still better, in either of the following solutions: (1) Mastic solution, formed by dissolving a drachm of mastic in an ounce and a half of Eau de Cologne; or (2) Ethereal tincture of tannin, formed by dissolving a drachm each of tannin and mastic in an ounce and a half of sulphuric ether. By these means, a painful tooth may be often brought into a state in which it will bear stopping. The patient's sensations will warn him against drinking very hot or cold, or sweet or acid fluids, and against exposure to cold draughts of air. Whenever the teeth exhibit a tendency to rapid decay, general tonic treatment is indicated.

2. *Necrosis* is an affection which is characterised by blackness of the tooth and looseness in its socket. It may be caused by violence, accompanied with destruction of the nutrient vessels, or by inflammation of the pulp. If the tooth gives trouble, it must be extracted. Necrosis of the teeth is quite distinct from the very destructive necrosis of the dental alveolar processes and of the jaws generally, which results from the poisonous action of phosphorus fumes, or from the very similar affection which sometimes follows the eruptive fevers. For an account of the singular and terrible disease from which artisans employed in making lucifer-matches suffer, in consequence of their inhaling the fumes of phosphorus (probably in the form of phosphorous acid), which was first noticed in 1839, we may refer to a review of Von Bibra and Geist's exhaustive treatise (in German) on the subject in the *British and Foreign Medico-chirurgical Review* for April 1848; and to an article on 'Phosphorus Workers,' in the Fifth Report of the Medical Officer of Health. Reference is also made to the disease in the article Phosphorus in this work. The necrosis and exfoliation of the alveolar processes and portions of the jaws in children, consequent upon the eruptive fevers, is accompanied by the shedding of the teeth; and according to Mr Salter, surgeon-dentist to Guy's Hospital, who was the first to describe its true nature, is essentially the same as the necrosis in phosphorus-poisoning, and, like it, is the result of the local application of a specific poison, generated within the individual, to the vascular parts of the teeth. For a description of

this remarkable disease, and of the treatment to be adopted, we must refer to Mr Salter's article on 'Exanthematous Jaw-necrosis,' in Holmes's *System of Surgery.*

3. *Alveolar abscess* may be defined as a suppuration around the fang or fangs of a tooth, usually carious, accompanied by absorption of the bony walls of the alveolar process, and enlargement of the little sac of pus or matter, which gradually makes its way to the surface, 'either along a canal by the side of the fang of the tooth opening at the edge of the gum, or through the gum itself at a point corresponding to the end of the root (or roots) of the tooth implicated. When, however, the fangs are unusually long, or the reflection of the mucous membrane from the gum to the cheek or lip is very superficial, this same discharge may burrow still more outwardly, and find its exit upon the surface of the face.'—Salter, *op. cit.*, p. 2. When the discharge bursts, as it most commonly does, through the gum, the alveolar abscess is reduced to its simplest form, and is known as a *gum-boil.* When the discharge takes place in the region of the cheek or chin, the true nature of the case may easily be mistaken by a careless surgeon, who might refer the symptoms to bone-disease. The cause of this affection is either caries or necrosis. In its earliest stage, the disease may be cut short by the extraction of the affected tooth, or even by the removal of the stopping, if the tooth is a stopped tooth. If it is desirable to save (for appearance' sake or otherwise) a threatened tooth, the gum should be freely leeched, and hot fomentations applied to the swollen part of the face, and the system should be briskly purged. As soon as matter can be detected, it should be allowed to escape by a puncture made through the gum—an operation which is followed by immediate relief, and by rapid subsidence of the swelling, although pus continues to be discharged for a considerable time. Indeed, the disease seldom ceases altogether till the offending tooth is removed. When the abscess shews symptoms of pointing on the face, the tooth must be at once extracted, and more serious surgical interference will probably be necessary.

4. *Toothache* is not so much a disease as a symptom of various morbid states of the affected part, which, for convenience, may be classed under this single heading. 'Toothache,' says Dr Wood, 'offers every possible variety in degree, character, and duration. The pain runs through all the grades which intervene between a slight sensation of uneasiness and unsupportable agony. It may be dull, aching, heavy, sharp, pungent, throbbing, grinding, or lancinating. It may be continued or paroxysmal, remittent or intermittent, and regular or irregular in its recurrence. It may come in flashes, and as suddenly disappear; or may continue a long time with little variation.'—*Practice of Medicine*, 4th ed. vol. i. p. 512. According to the various conditions which give rise to it, toothache may be divided into: (*a.*) *Inflammatory toothache,* which is almost always dependent upon caries. The inflammation may be seated in the pulp of the tooth, in the nerve-twig entering the pulp-cavity, or in the periosteum investing its roots, and reflected over the interior of the alveolar cavity. There is generally some external swelling after the pain has continued for some time, and it occasionally extends to the salivary glands. The tooth is at the same time very tender, and any force applied to it aggravates the pain, which is also increased by hot and cold liquids taken into the mouth. When, as in the great majority of these cases, the pain is associated with caries, the best treatment is as follows: 'Let the patient have a dose of calomel and colocynth; confine him to spoon-diet; let him wash out the mouth with a solution of carbonate of soda in tepid water; let the gum around the tooth, and between it and its neighbours, if tumid and tender, be deeply scarified with a fine lancet; then let the cavity be filled loosely with a little bit of cotton-wool, dipped into the solution of tannin and mastic (for which the formula has been already given); and if the toothache be curable at all, this plan, with a little patience, will be almost sure to succeed. If the pain is very violent, half a grain of powdered acetate of morphia may be taken up with the cotton imbued with the tannin, which should be warmed before it is put into the cavity. As soon as the pain is relieved, the tooth, if of use, should be stopped with gold or amalgam; or if of no use, it should be extracted. It may be added, that most of the violent, burning, empirical nostrums, such as creosote, oil of thyme, &c., although they may be of service when introduced in small quantity by a skilful hand into the carious tooth at the right time, can do nothing but mischief when employed indiscriminately, as they are by the vulgar.'—Druitt's *Surgeon's Vade-mecum*, 8th ed. p. 458. (*b.*) *Neuralgic toothache* may occur either in sound or in carious teeth. It may be recognised by its occurrence in paroxysms at more or less regular intervals, and by its being attended with little or no swelling of the external parts. It is very common in the earlier months of pregnancy, and in persons of a general neuralgic tendency, and is often excited by changes in the weather. The treatment is the same as for neuralgia generally. After the bowels have been freely opened, chalybeates and quinine must be given in large doses, and frictions with veratria or tincture of aconite (both of which are energetic poisons) may be carefully applied to the gum. (*c.*) *Rheumatic and gouty toothache* may occur in sound or in carious teeth in rheumatic or gouty persons. The constitutional treatment applicable to these diseases must be tried, together with the local applications already noticed.

5. *Falling of the teeth,* due to absorption of the socket, may be regarded as almost an ordinary consequence of old age; but it frequently occurs under the popular name of *scurvy of the gums* in middle age, although very seldom before the 30th year. True scurvy, gangrene of the mouth, or mercurial inflammation of the gums, may cause the loosening of the teeth at any age; but there are two other conditions which lead to the same result. In one of these affections, the gums swell, and assume a deep red colour, and the inflammation appears to be propagated into the alveoli, producing a thickening of the periosteum, and a consequent elevation of the tooth above its ordinary level. By frequently recurring attacks of this inflammation, the tooth is lifted out of its socket, while the gum retreats from the neck, and leaves a portion of the roots exposed. The tooth thus deprived of its support at length falls, after which the gum heals, and the patient is relieved. The remedies indicated are those tending to relieve inflammation of the gum, but they are seldom successful. In the other affection, there is conjoined suppuration of the gums and sockets, and the disease first shews itself by an oozing of pus from behind the edges of the gums when they are pressed. From the absorption of the sockets, and the simultaneous retreat of the gums, the teeth, as in the previous case, at length fall out, if they have not, for the patient's comfort, been previously extracted. Little can be done in the way of treatment in this form of the affection.

6. *Painful and difficult eruption of the wisdom-teeth* requires a few remarks. The cutting of these teeth is often accompanied by distressing symptoms which may be protracted for months, or even years

unless surgical aid is called in. The difficulties arise from the position occupied by these teeth, so close to the joint of the lower jaw, where the mucous membrane is reflected from the gums to the cheek and fauces, combined with the very common condition, that the jaw is not sufficiently elongated backwards to allow the *dentes sapientiæ* to range in the horizontal series with the other teeth.' This mechanical difficulty not only holds back these teeth in their bony bed, but it often prevents their proper direction of growth. As a consequence of these displacements in the upper jaw, it often happens that when the jaws are brought together, a bit of mucous membrane is nipped and pinched, leading first to ulceration and extreme tenderness, and subsequently to cicatrisation and stiffness of the parts. From insufficient room in the lower jaw, the crown only partially emerges through the gum, the first cusp coming through it, while the hinder cusps remain covered. This produces a terrible pinching of the mucous membrane over the tooth every time the jaws are brought in contact. Another troublesome symptom, often associated with the painful cutting of a lower wisdom-tooth, is spasmodic but continuous contraction of the masseter muscle, so as to keep the jaws nearly closed, and capable of only slight separation. The most distressing result, however, is the suppuration that often attends the difficult eruption of the tooth. Even in ordinary cases, when none of these complications are present, there is often a good deal of diffuse and erratic pain in cutting a wisdom-tooth. It is unnecessary to enter into the treatment, which must be left entirely to the surgeon-dentist.

7. *Hæmorrhage after extraction of teeth* has occasionally proved fatal, and is not very unfrequently a troublesome and even dangerous complication of the operation. In most of the recorded cases, there has been distinct evidence of the existence of the hæmorrhagic diathesis, or, in other words, of a liability to bleeding profusely from the most trivial wounds. No better local treatment can be recommended than that which was suggested by John Hunter nearly a century ago. 'In general, it will be sufficient to stuff the socket with lint, or lint dipped in oil of turpentine, and to apply a compress of lint or a piece of cork thicker than the bodies of the adjacent teeth, so that the teeth in the opposite jaw may keep up a pressure.' Matico and saturated alcoholic solution of tannin may be equally efficacious as styptics, but are not superior to oil of turpentine. In some cases, the extracted tooth has been successfully replaced as a plug. The internal administration of astringents, such as tannin and oil of turpentine, should be combined with the local treatment.

8. The subject of *Tartar* on the teeth has been considered in a special article.

TEFF. See MEADOW GRASS.

TE'FSA, TA'DLA, or **TEDLA,** a town of Morocco, 135 miles north-east of the city of that name, stands in the fertile, well-peopled district of Tadla, on the banks of the Um-er-Beg. It is one of the oldest towns of the country, and its manufactures of woollen cloths and shawls are important. Together with the small town or suburb of Efza, T. contains 11,000 inhabitants, 2000 of whom are Jews.

TEGNER, ESAJAS, a Swedish poet of high reputation, was born in 1782 at Kyrkerud, in the Swedish province of Wermland, and educated at the university of Lund, where he took the degree of M.A. in 1802. In 1805 he was appointed sub-librarian to the university, and lecturer on æsthetics. In 1811, the Academy prize was awarded to T.'s poem of *Svea*, or Sweden, which at once raised him to the rank of one of the most popular writers of his country. Prior to the appearance of this successful poem, he had written several spirited war-songs and national odes, which had attracted the favourable notice of the king and government. In 1812, he became professor of Greek, and at the same time was ordained to the pastoral care of the parish of Stäfje. During the next ten or twelve years of his life, he devoted himself to the prosecution of his clerical duties, and the acquisition of theological learning, with an earnest and unwearying zeal which was scarcely to be expected from his previous indulgence in the pleasures of society, and his natural inclination towards the exhibition of a taste for coarse humour and equivocal puns. During this period, he composed his two famous religious idyls of *Prestvigelsen*, or the 'Consecration of a Priest,' and *Nattvardsbarnen*, or 'The Young Communicants,' and wrote his *Axel*, a poetic romance, which is regarded by some Swedish critics as even superior to his *Frithiof's Saga*, of which the first cantos appeared in a literary journal, edited by the historian Gejer, under the title of the *Iduna*, and conducted under the auspices of the Gothic Society, the leading object of which was to foster national literature, and put down the prevalent taste for the pedantic classical or foreign school of writing. In 1825, T. published the closing parts of *Frithiof's Saga*, which rather errs in the opposite direction, and follows too closely the ancient saga on which the tale is founded. But notwithstanding the inharmonious character of the composition, which may be regarded rather as a collection of many ballads and odes in various metres than as a complete epic, the *Frithiof's Saga* became the most popular poem of Sweden, and attracted to its author the admiration and notice both of his fellow-clergy and of the sovereign, as was evinced in 1824 by the clergy of the diocese of Wexio nominating him for the vacant bishopric, and the king at once appointing him to the see. In his place at the Diet, as a member of the Chamber of the Clergy, he made himself conspicuous for his support of ultra-conservative views, in opposition to the extreme liberal doctrines which he had advocated in early life. His speeches in the Chamber and on numerous other public occasions have a great reputation in Sweden and Norway, and are devoted to the discussion of questions of education, literature, and finance. In 1839, T. was proposed for the archbishopric of Upsala; but in the following year, he was seized with unmistakable symptoms of insanity, which had been strongly manifested in two of his brothers and other members of his family. Although, after a few months' confinement in an asylum, he was able to return to his work, his health soon broke down; and after lingering for many months in a paralytic condition, he died in 1846. His collective works were edited by his son-in-law, Professor Böttiger, and published in 6 volumes (Stock. 1848). All his larger and more popular poems have been translated into German, French, and English; and among the English translations of his *Axel* and *Frithiof*, those by R. G. Latham (1838), G. Stephens (1841), and the American poet Longfellow, are the best.

TEHRA'N, frequently spelled TEHERAN, capital of Persia, and of the province of Irak-Ajemi, 70 miles south of the shore of the Caspian Sea. It stands on a wide, stony plain, dotted here and there with mud-built villages, and pierced with many circular pits, which reach down to the great subterranean water-courses, on which, in this region, the life of animal and plant is altogether dependent. On the north-east runs the lofty range of the Elburz Mountains, rising in Demavend to the height of 22,000 feet above sea-level, and giving dignity to an otherwise tame and

unattractive scene. The town is built almost entirely of mud-houses, packed within a mud-wall 20 feet high, and 4 miles in circumference. The principal buildings are the British and Russian residencies; the bázár of Taki Khan, finished in 1850—1851, at a cost of £30,000; the Ark, or Citadel—in the suburbs—is the Shah's palace, and about 2½ miles north of these, the Castle of the Kajars (Kasr-i-Kajar), the 'Windsor' of the Persian rulers. Carpets are manufactured; and an attempt was made in 1859 to establish a cotton-factory in the vicinity of the city. The total cost of this factory, from the date of its establishment to July 1861, was £136,000, but it had been so grossly mismanaged that the returns were quite inconsiderable. The chief trades are shoemaking and the manufacture of hats and linen goods. Pop. 100,000, but in winter it is considerably more.—In the vicinity of T. are the ruins of Rei, the *Rhages* of Scripture, known in the time of Alexander the Great under the name of *Ragæ*, and the birthplace of Harûn-al-Raschid.—See Eastwick, *A Diplomate's Residence in Persia* (2 vols., Lond. 1864).

TEHUANTEPE'C, a river-port of the south of Mexico, in the territory of the same name, and 10 miles above the mouth of the river Tehuantepec, in the bay also of that name. The inhabitants (14,000) are engaged in manufacturing salt and cotton fabrics, and in indigo-planting. A railroad has been located, though not built, across the isthmus, and a route for a canal of 173 miles has been explored.

TEÏ'DÆ. See MONITOR.

TE I'GITUR, one of the service-books of the Catholic Church. It is properly but an extract from the Roman Missal, and contains the canon of the mass, and certain other portions of the Liturgy which do not vary with the variety of festivals or of the ecclesiastical seasons, but are always the same. It is so called from the first words of the canon, *Te Igitur, Clementissime Pater*. This service-book, as distinct from the missal, was used, and is still used by bishops, prelates, and other dignitaries; and as the 'canon' is the most sacred part of the service, oaths upon the Te Igitur were regarded as especially solemn. The Te Igitur appears to have been used as the ordeal 'of compurgation.'

TEI'GNMOUTH, a seaport, market-town, and favourite watering-place on the south coast of Devonshire, on the north side of the estuary of the Teign. In front, on the sea-side, is the wide esplanade known as the *Den*, formed of a huge bank of sand, accumulated in the course of ages at the river's mouth—one of the chief features of the place. The harbour is safe and commodious, though difficult of entrance, the channel of the river being obstructed by a shifting bar of sand. The chief imports are coal and culm; the exports, granite from Dartmoor and china-clay; there is also a considerable sea and river fishery. T. is connected with Shaldon, on the other side of the river, by a wooden bridge (completed in 1827) of 34 spans, 1671 feet in length, with a swing over the main channel for the passage of ships. The climate is mild and salubrious, and the country around beautiful. It is a station on the South Devon Railway. Pop. (1881) 7100.

TEINDS, the name given in the Law of Scotland to Tithes (q. v.). In Scotland, tithes were not, as in some other countries, considered to be due from the produce of industry generally, but were only paid from the produce of land or cattle. The teinds of corn, called *decimæ garbales*, greater teinds, or parsonage teinds, were generally exigible from all landed property, and originally paid to the rector or parson serving the cure, a small portion being claimed by the bishop. The tithe of the produce of animals, as wool, milk, cheese, was called lesser teind, or vicarage teind, because, where due, it was paid to the vicar; but vicarage teind was only legally exigible where a usage of paying it could be shewn. The teinds, supposed to be due at common law to the incumbent of the parish, had, previously to the Reformation, been largely diverted elsewhere (see COMMENDATORS); in some instances, they had been bestowed on some favourite religious house by the patron, who seemed to consider himself their absolute proprietor; in others, they had been feued to some layman. In many cases the religious house which had acquired the teinds, profited, or at least saved itself from odium, by selling them to the crown or to a lay subject; and not unfrequently the pope, who was viewed as patron of all benefices to which no one else could claim a right of presentation, granted to the lands of churchmen an exemption from the payment of teind. At the Reformation, the church-lands were claimed by the crown; those that had belonged to the religious houses were erected into temporal lordships, whose proprietors, called *Lords of Erection*, or *Titulars*, were nominally burdened with the support of the clergy, by salaries modified out of a third part of the benefices. At the majority of James VI., it was found advisable to check the practice of granting the lands of religious houses to laymen; and the church lands were declared, with certain exceptions, to be inalienably annexed to the crown.

The right to tithes was, in Scotland as elsewhere, originally made effectual by their owner drawing the *ipsa corpora*, separating every tenth sheaf after the crop was reaped. But this proceeding often became an instrument of oppression, as the proprietor was obliged to allow his crop to remain on the ground exposed to all the vicissitudes of the season, until the beneficiary chose to draw his teind; and prior to the Reformation, agreements had become common by which a certain quantity of grain, called *Rental Bolls*, was accepted in full value of teind, while leases were sometimes granted of the teinds for a money payment.

Various not very successful attempts were made during the reign of James VI. to regulate the conflicting interests of heritor and titular, and to provide the clergy with stipends which would not be illusory, out of the teinds of their respective parishes. Charles I., soon after his accession, issued, without the intervention of parliament, a revocation of all appropriations of church lands and teinds made during the two preceding reigns. The powerful barons who were possessors of church property at first menaced resistance, but eventually shewed a desire for compromise, and the parties principally concerned entered into four submissions, in which they accepted his majesty's arbitration. The decrees arbitral pronounced by the king resulted in the establishment of valuations of teinds, and sales of them to the proprietor of the lands, by which the division of the produce between the owner of the land and the owner of the teind was avoided; and the teinds were made available to their utmost extent for the support of the parochial clergy. A commission, appointed to carry out the decrees arbitral, was continued from time to time till the Union, when its authority came to be vested in the Court of Session, as Court of the Commission of Teinds, the same tribunal which still exercises jurisdiction, both judicial and ministerial, in questions relating to teinds. A heritor, and in some circumstances the minister, may pursue an action of valuation of teinds; and the heritor may also insist on purchasing the teinds of his lands when valued, that is, in paying the value of the annuity in a slump sum. The modifying of reasonable stipends to the clergy

out of the teinds of their respective parishes, is one of the functions of the Court of Commission of Teinds. The practice of augmenting stipends after they have once been modified was introduced with some hesitation; confined at first to stipends below the minimum, it afterwards became general; and was recognised by act 48 Geo. III. c. 138, which provides that no stipend can be augmented till 20 years have elapsed from a previous augmentation. By 50 Geo. III. c. 54, it was provided that the minimum annual value of any stipend should be £150; and if such amount cannot be made up by the teinds, it is supplied from the Exchequer. See STIPEND.

The present position of the tithes of Scotland is as follows: In the majority of cases they have been purchased by the proprietors of the respective lands. after the modification of stipends to the ministers, and are held liable to the burden of augmenting those stipends to the extent of their value; in other words, there are no tithes, but part of the rent of the proprietors constitutes minister's stipend, and an additional part is liable to augmentation of stipend. A part of the tithes are in the hands of titulars, also liable to stipend and augmentation—they are, however, no longer drawn in kind, but paid according to valuation, or compounded for in the few cases where they remain unvalued. The teinds which were held before the Reformation by the bishops and other dignified clergy, are in the hands of the crown, liable to augmentation of stipend. The teinds which remained in possession of the parochial clergy, still belong to them, but are commuted; and those belonging to colleges, &c., are paid by composition, but have not been sold to the owners of the lands.

TEJUCIGALPA. See SUPPLEMENT in Vol. X.

TEKELI (more properly, *Tökely*), EMERIC, COUNT, a celebrated Hungarian patriot, was descended from a noble Lutheran family, and was born at the castle of Kasmark, in the county of Zips, in 1656. His father, Count Stephen, had been implicated in the conspiracy of Zriny and Ragotsky to free Hungary from the rule of Austria; and, after his death. and the execution of Zriny, and others, young T. sought an asylum in Poland, where he had large possessions. After vain endeavours to recover from the emperor his patrimonial estates, he repaired to the court of Abaffi, Prince of Transylvania, who put him at the head of an army of 20,000 men, with which, in 1678, he invaded Hungary. Being joined by numbers of the malcontents, he rapidly extended his conquests, made predatory inroads even into Austria, Styria, and Moravia, till Leopold I. was forced (1681) to temporise with the insurgents, and thus gained over a portion of them. But T. distrusting, with good reason, the emperor's sincerity, refused to disarm, and being joined by the Transylvanian prince and the Turks, he was declared by the Sultan Mohammed IV. (1682) king of Upper Hungary, and again recovered most of the country. T. joined Kara Mustapha in his celebrated inroad upon Austria; but after the failure of the expedition many of his followers fell off from him, and his patron the sultan being prejudiced by his enemies against him, he was twice imprisoned by the Turks; and during his detention, Hungary was wholly overrun by the Austrians, and Transylvania separated from the Turkish alliance. T., however, was favoured by a brilliant though ephemeral change of fortune in 1690, when, at the head of a Turkish force, he burst into Transylvania, routed the combined Austrians and natives repeatedly, and woke up the energies of his partisans in Hungary; but the imperialists, under the Markgraf of Baden, routed his allies the Turks at Salankemen (August 19, 1691), and under Prince Eugene of Savoy, so completely demolished them at Zenta (September 11, 1697), that they gladly agreed to the peace of Carlovitz (November 14, 1697), by which all aid to the Hungarian malcontents was withdrawn. From this time, T. lived in retirement in Turkey, at first being munificently entertained by the Turkish government, but afterwards so completely neglected that he was forced to adopt the occupation of a vintner. He died at Constantinople in 1705.—His wife, Helena, the widow of Ragotsky, was celebrated over all Europe for her beauty, but was no less distinguished for her heroic gallantry, as was proved by her obstinate defence of her castle of Mongatz (Hung. *Munkacs*) against an army of imperialists. Forced to surrender, to save the lives of her children and the property of her (Ragotsky's) family, she was afterwards exchanged for an Austrian general whom T. had captured; and joining her husband at the cost of abandoning her children, shared the vicissitudes of his fortune, and died in 1703.

TELAMO'NES (see ATLANTES), statues employed as columns, to support a wall, cornice, &c.

TELEDU (*Mydaus meliceps*), a quadruped of the Weasel family (*Mustelidæ*), a native of the mountains of Java, at an elevation of 7000 feet and upwards; remarkable, like the Skunk (q. v.) of America, for the excessive fetor of a volatile secretion formed in glands situated a little within the rectum, the emission of which is its principal means of defence.

TE'LEGRAM, a communication sent by Telegraph (q. v.). This word, which was coined recently by a writer in the *Times* newspaper, was objected to at the time by Greek scholars as a barbarous formation. According to the law of Greek compounds, *grapho*, compounded with anything but a preposition, becomes *grapheo*; therefore, with *tēle*, it would be *telegrapheo*, the noun from which would be *telegraphēma*. The convenient conciseness of *telegram* has, however, made it triumph over the more correct *telegrapheme*.

TE'LEGRAPH (Gr. *tele*, far off, and *graph-*, to write) is a general name for any means of conveying intelligence other than by voice or writing. The idea of speed is also implied. Alarm-fires (see BEACON), the Semaphore (q. v.), and the Signals (q. v.) used at sea, are among the earlier forms of telegraph. But all other agents are now thrown into the shade by the electric telegraph. The various forms of electric telegraphs in general use are electromagnetic. The signals are given by the deflection of a needle to the right or left, or by mechanism connected with the armature of an electro-magnet, which sways to and fro under the action of the magnet and a counter-spring, or between two opposite electro-magnets. Electric telegraphs are of two kinds—those which merely give passing signals to the observer or listener, and those which permanently record their signals; the former may be called signalling, the latter recording telegraphs. The number of inventions connected with the electric telegraph is almost endless; we shall here content ourselves with giving a mere outline of the working of the telegraph as at present existing on most lines; assuming that the reader is acquainted with the chief facts of Galvanism (q. v.) and electromagnetism. See MAGNETISM. The forms most in use are Morse's Telegraph, and Cooke and Wheatstone's Needle Telegraph. For private use, some form of the magneto-electric dial telegraph is employed. In point of simplicity and certainty, Morse's system cannot be exceeded, and even as regards speed, it stands equal, or nearly so, to the most rapid recorders. We shall therefore give an account of the general arrangements of a telegraph chiefly on Morse's system.

Morse's Recording Instrument, or, as it is shortly called, the 'Morse' or 'Register,' is shewn in fig. 1. L is the line-wire, and E the earth-wire, conveying the current from the distant station. The current thus sent traverses the coils of the electro-magnet, MM', the armature, A, of which is in consequence drawn down. A is attached to the lever *ll'*, moving

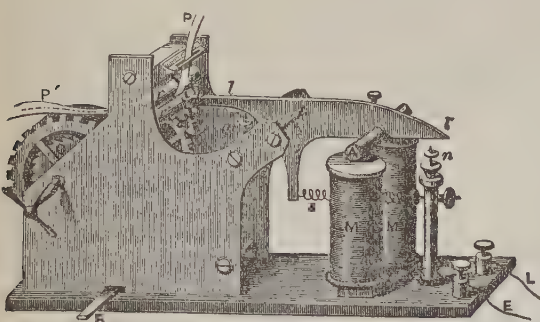


Fig. 1.

round the axis *k*. By the attraction of A, the end *l'* is lowered, and brought against the stud *n*. The armature must not touch the soft iron of the electro-magnet on being drawn down, for if it did, it would stick, and would not be instantly released when the current ceases. When the end *l'* is lowered, the end *l* is raised; *ll'*, at its inner end, carries a steel point or style, *p*, which by the upward motion is brought against a strip of paper, PP', carried towards P' by the rollers *rr'*, set in motion by clock-work, C, quite independently of electricity. The clock-work is liberated or stopped by the switch S. The paper is supplied from a large roll or bobbin, above the instrument, which turns round as the rollers demand. So long as the style is elevated, the paper strip is made by the clock-work to rub against it. A line is thus embossed on its upper surface. To facilitate the doing of this, there is a groove in the upper roller, opposite the style. When the current from the distant station ceases, the lever *ll'* is pulled back to its original position by the spring *s*, and the style falls away from the paper. To prevent it falling too far, another stud, *m*, lies on the other side of the axis. When the circuit is again closed, the style once more marks the paper, and thus the lever keeps oscillating under the opposing actions of the magnetism developed by the transmitted current, and the elasticity of the spring *s*. The time that the style remains elevated, determines the kind of mark on the paper. If it is nearly momentary, a dot is imprinted; for a longer time, a dash. We have thus the combinations of an alphabet in the combination of dots and dashes. Thus, A is a dot and a dash (. —); B, a dash and three dots (— . . .); &c. The alphabet is so arranged that the letters occurring most frequently are most easily signalled; thus, E is one dot; T, one dash. An expert telegrapher can transmit from thirty to forty words a minute by this instrument on a land-line of between 200 and 300 miles. Several modifications of Morse's telegraph have been made, the chief one being the substitution of ink-marking for embossing. The beautiful instruments of Siemens and Halske are of this kind.

A clerk that has been well accustomed to Morse's telegraph, in transcribing, seldom looks to the paper. The mere clicking of the lever becomes a language perfectly intelligible to him. He need therefore only look to the record when he may have heard indistinctly. Sir Charles Bright does away with the recording instrument altogether, and substitutes two bells, one muffled, the other clear, sounded by a hammer oscillating between them. The bells speak a telegraphic language as quick as the clerk can write. It is stated in favour of Bright's system (which is used by the Magnetic Company) that the signals are all as it were dots in Morse's instrument, and so take less time than dots and dashes. Recording instruments are generally considered preferable to instruments which merely signal, as they fix any fault of transmission or copying on the party at fault. Acoustic signalling, again, is preferable to ocular signalling, as a person can hear and write much more easily than see and write.

Transmitting Key.—Let us now transfer our attention to the distant station, to see how the current is transmitted from it. This is done by the transmitting key shewn in fig. 2. A brass lever, *ll*, moves round the axis A. On opposite sides of the axis, two nipples of platinum, *m*, *n*, are soldered to its lower sides. The nipple *m* is called the hammer. Below *n* is the stop anvil, *b*, tipped with platinum, which is in connection with the earth-wire E. Below the hammer, *m*, lies the anvil *a*, the nipple of which is likewise of platinum; *a* is connected by the wire C with one of the poles of the sending battery, generally the copper pole

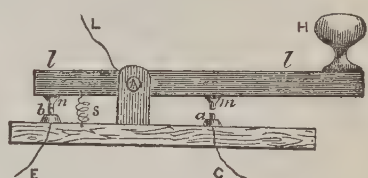


Fig. 2.

When the lever is left to itself, *n* and *b* are in contact under the force of the spring *s*. When the hand presses on the ebonite (insulating) handle H, contact is broken at *n* and *b*, and established at *m* and *a*. Three wires are in connection with the key, E and C just named, and L the line-wire from the distant station connected with the axis pillar, and therefore with the lever. When the key is in the receiving position, that shewn in the figure, the current from the sending station takes the route L, A, *l*, *n*, *b*, E, the Morse, then to earth. When H is pressed down, the key is in the sending position, and transmits the battery current by C, *a*, *m*, A, L, to the distant station. The play of the anvil and hammer need not be more than $\frac{1}{16}$th of an inch. This is more than sufficient for completely breaking the current, and it allows of speedy manipulation.

The Battery.—The batteries employed are in Great Britain almost universally Daniell's. See GALVANISM. Constancy and certainty of action is what is most wanted in the battery, and this Daniell's battery yields. In Germany, Bunsen's battery is also used, charged with diluted sulphuric acid, the carbon being immersed in a mixture of 1 of acid to 10 of water, and the zinc in one of 1 to 20. When batteries have to be moved about much, sand is put in, to keep the liquid from spilling. The number of cells employed varies with the distance, the insulation of the line, and the delicacy of the instruments. The register, as afterwards mentioned, is seldom worked directly by the transmitted current, but by relay. To work a relay

with good insulation, 60 Daniell's cells will suffice for a distance of 300 miles. For less distances, less of course will suffice. For short circuits, where the resistance is small and current strong, small cells soon exhaust themselves, large cells therefore must be used to maintain the supply. Magneto-electricity is also employed as a source of the current. This answers well on short circuits, or for private telegraphs, but experience has proved that the galvanic battery is by far the most advantageous source of electricity for extensive telegraphic work.

How Two Stations are connected together.—The manner in which two stations are 'joined up' on Morse's system is shewn in fig. 3. B and B_1 are

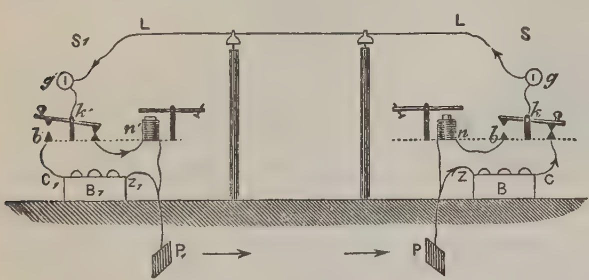


Fig. 3.

the batteries at the stations S, S_1; k, k' are the transmitting keys; n, n', the registers; g, g', the galvanometers; LL the line-wire insulated on posts; P, P_1, the earth-plates. When the key k, at the station S, which is here represented as the sending station, is depressed, the current from the battery B takes the following course. From the copper pole C, of the battery B, it goes to the anvil of k, passes through k to the galvanometer g, which having traversed, it goes into the line LL to the receiving station S_1, traverses the galvanometer, the key k', the coils of the register n'; thence it goes 'to earth' at the plate P_2, returns by the ground to P at the sending station, and thus finally reaches the zinc pole Z of the battery B. At station S, b and n are out of circuit; and at S_1, b' and battery B_1 are out of circuit; n is thrown out of circuit, because its coil offers a resistance equal to several miles of the line-wire, and it is requisite to keep down the resistance to the minimum. If it were in circuit, both registers could print simultaneously, but that is not necessary, one record at the receiving station being enough. The sender would thus have no idea as to whether his message had told or not, did not the motions of the needle of the galvanometer, g, reveal the currents put in circuit. The galvanometer also shews the presence of earth-currents on the line. If k were left to itself, and k' depressed, the station S_1 would then be the sending, and S the receiving station, and the connections would be exactly as shewn in the figure, only at opposite stations.

Suppose the clerk at S wishes to telegraph to S_1, he depresses the key k several times, so as to send a series of dots and dashes giving the name of the station. The attention of S_1 is first arrested by the clicking of the armature of the Morse. He thereupon turns the switch S (fig. 1), and sets the clockwork in motion, and sends back to S that he is ready, and the printing thereupon begins. When both keys are depressed, the whole circuit is broken, so that when both sender and receiver have their hands on their respective keys, no message can be sent. One might fancy that confusion would arise from cross messages, but clerks soon get over this inconvenience, and communicate back and forward with perfect facility. There is a code of working signals to indicate the kind of message, 'repeat,' 'understand,' &c., besides numerous recognised contractions. To arrest the attention of attendants, the current is sometimes made to ring an alarum bell.

The Line.—Telegraphic stations must be united by one insulated wire, either carried over land or under the sea. The insulation of land-lines is insured by attaching the wires to insulators fixed on posts some 20 feet high. The posts are placed at distances corresponding to the number of wires they have to carry. A distance of 80 yards is the ordinary distance for posts sustaining several wires, and 150 yards for those only supporting one. Insulators are of all shapes. Porcelain, though a better conductor than glass, is not so apt to attract moisture, and is the substance generally employed for them. The leakage in a long line, notwithstanding the best insulation, is considerable. The loss at each post is insignificant, but when hundreds or thousands are taken into account it becomes decided, so that merely a fraction of the total current that sets out reaches the earth at the distant station. In rainy, and more especially in misty weather, the insulation suffers much.

The wire most employed for telegraphic circuits is No. 8 ($\frac{1}{8}$th of an inch). The Electric Telegraph Company are beginning to use No. 4 wire on some of their long trunk lines.

A Submarine Line is made by a cable. The core of the cable consists of one wire, or a strand of several wires of copper, as pure as can be got in the market. One solid wire is preferable to a strand of the same diameter in point of conducting power; but a strand is surer; for when one wire is broken at any point, the others still remain to conduct the current; there is no 'breach of continuity.' When the one solid wire gets broken, which not unfrequently occurs without being visible outside, the cable becomes useless. The strand of wire is generally laid up in Chatterton's compound, consisting of gutta-percha and resinous substances. The interstices between the wires are thus filled up, and this makes the cable solid throughout. It not unfrequently happens, when this precaution is not taken, that water, under the great pressure of ocean depths, becomes injected into them. The strand thus laid up, is now included in one or more coatings of gutta-percha, which acts as the insulating protection for the wire. Chatterton's compound is generally put between the layers of gutta-percha. The whole is finally included in a sheathing of iron wire, laid on spirally, to give the cable sufficient strength to withstand the strain of paying out, or that to which it may be subjected by the inequalities of the ocean bed. Between the iron sheathing and the gutta-percha, a layer of tarred yarn is put, which acts as a padding between the two, and improves the insulation of the cable. Not unfrequently the iron wire of the sheathing is also protected from corrosion by tarred hemp. Fig. 4 (full size) shews the construction of the Malta and Alexandria

Fig. 4.

cable, 1330 nautical miles long, and one of the best in operation. The different layers are so far peeled off to shew the construction. C is a strand of seven copper wires, laid in Chatterton's compound; G, three layers of gutta-percha, with Chatterton's compound between each; H, tarred yarn; and I, the eighteen wires constituting the sheathing. The diameter out in the sea is 0·85 of an inch. Near the shore, the sheathing is made much stronger, to meet the danger of accident from the dragging of anchors.

Considerable dispute has arisen as to the best material for insulating marine cables. India-rubber and gutta-percha are the two rival substances. It may be said in favour of gutta-percha, that not one yard of it, when laid, has decayed, and that under ocean pressures, as proved by the Atlantic cable of 1865, its insulating power decidedly improves. In favour of well masticated india-rubber, it is urged that cables, alike in other respects, will, when coated with it instead of gutta-percha, be capable of sending twice the number of words per minute, the specific inductive capacity being so much greater for the latter than for the former substance. On the other hand, india-rubber is not so trustworthy in point of durability, some specimens of it having become treacly after immersion for some time in the sea.

The Earth.—Two wires are not necessary to connect two telegraphic stations, as might be supposed. One wire is quite sufficient, provided its terminations be formed by large plates sunk in the ground, or something equivalent. The plates are generally of copper, and should not offer a surface less than 20 square feet, and they must be buried so deep, that the earth about them never gets dry. The gas and water pipes in a town make an excellent 'earth' (earth connection). The great object in an 'earth' is to put the whole ground in the neighbourhood in connection with the battery pole or line-wire, and much the same precautions must be taken in making an earth for a telegraph as for a Lightning-conductor (q. v.). If the earth is not good, the current, instead of taking the ground as a passage to the distant station, runs into other wires connected with the plate, and leading to where the 'earth' is good. When the 'earths' are good, the current passes through the earth between the two stations, no matter what be the nature of the country it has to pass, plain or mountain, sea or land. The earth-resistance to the current, compared with that of a long line, is next to nothing. The earth not only serves the purpose of a second wire, but of one so thick that its resistance may be left out of account, and thus halves the resistance of the whole circuit. One good 'earth' serves for all the circuits of a telegraphic station.

Return Current—Inductive Embarrassment.—When the line-wire at a distant station is 'cut' (insulated or disconnected with the ground), and is placed in connection with one of the poles of a battery, the other pole of which is to earth, at the instant in which the connection is made, a current flows into the wire, and if the insulation of the line be perfect, almost instantly ceases. The needle of the galvanometer makes a sudden deflection, and then returns to its position of rest. If now, at one turn of a commutator, the battery connection be cut off, and the line be put to earth, the needle deflects momentarily in the opposite way, and the charge given to the wire returns, and goes to earth. This flowing back again of the charge is called the *return current*. In land-lines, the return current is very slight; in submarine cables, it is very marked. The return current shews that a telegraphic line may be charged statically, just like the insulated balls, cylinders, &c., illustrating frictional electricity. A line of telegraph may be looked upon as a Leyden jar, the wire as the inner coating, the air or gutta-percha as the glass or dielectric, and the earth or sea as the outer coating. A coil of submarine cable, immersed in a trough of water when the core is insulated, may be charged and discharged exactly as a Leyden jar, the water being the outer coating. The return current is most marked in long lines. In such, it is not necessary to 'cut' the wire, the great resistance of the long wire being equivalent to partial insulation; the return current being, however, much smaller in extent.

The statical charge, of which a line of telegraph is thus capable, shews that the electric force not only tends to propagate itself longitudinally, but laterally. The effect of lateral induction is to retard the time of delivery of a signal, and to prolong it so that although it is a momentary signal at starting, it becomes a prolonged signal at its destination. Wheatstone's calculation (see ELECTRICITY) gives a velocity of 288,000 miles per second for electric discharge. If signals were propagated at this rate, the time elapsing between the sending and delivering of a current, even on a line extending over one half the circumference of the globe, would be inappreciable. But in aërial lines of land telegraphs, even only a few hundred miles in length, there is evidence that electricity does not propagate itself at anything like that speed; and in submarine cables, the velocity scarcely reaches thousands of miles per second. The mere slowing of the message would not matter so much, provided the signals, when they reached their destination, were told out as they were sent. But they are not. Each signal at the receiving station takes a longer time to leave the line than it did to enter it. Hence, in a very long land-line, or in a cable, if the sender transmitted at the same rate as he does in short circuits, the signals would run into each other at the receiving station, and be undistinguishable. Time must be given to allow each signal to ooze out of the cable before another is sent. The effects of lateral induction on the transmission of telegraphic currents constitute what is termed *inductive embarrassment.*

According to Professor Thomson, the maximum speed attainable on an aërial land-line of 2000 nautical miles in length, and consisting of an iron wire one-fourth of an inch in diameter, would be 20 words per minute. The same authority has established, that *the retardation increases with the square of the length of the line.*

The insulation of submarine cables is almost perfect, so that inductive embarrassment must not be confounded with leakage. The insulation of the Atlantic cable of 1865 was so perfect, that when 'cut' and charged, it would have fallen from charge to half-charge in 15 minutes.

Earth-currents.—These are very unwelcome visitors in telegraphic offices. They get into the circuit no one knows how. They flow sometimes in one direction, sometimes in another, change rapidly, and are frequently so strong as to render the line for the time quite useless. They seem to come as often from the wire as from the earth. They occur simultaneously with magnetic storms. The famous magnetic storm that raged on August 2, 1865, at the same time that the Atlantic cable ceased to act, was accompanied by earth-currents so strong that the astronomer-royal considered it impossible, even if the cable had been perfect, to have signalled through it. The only remedy for earth-currents is to do away with the earth-circuit and put two wires to the same place in one circuit. Although the earth-current runs equally strong in

both, the two wires bring it to opposite ends of the instruments at the stations, and its effect is thereby neutralised. This, of course, can only be done where two wires exist. Little or nothing is as yet known of the laws regulating such currents.

Relay (Ger. *Uebertrāger*).—Hitherto, we have supposed that the recording instrument of Morse is worked directly by the line-current. This is only done on short circuits, generally less than 50 miles. On long circuits, direct working could only be accomplished by an enormous sending-battery. The loss by leakage on the way is very considerable, so that a current strong at starting loses greatly before it reaches the station intended; besides, the leakage becomes all the greater the greater the number of cells employed, or the greater the tension of the battery. It is found a much better arrangement to get the 'Morse' worked by a local current, which may be made as strong as requisite without any loss, and to include a very delicate instrument in the line-circuit, which has only to make or break the local circuit. Such an instrument is called a relay, the principle of the action of which is shewn in fig. 5. Instead of the electro-magnet of the register

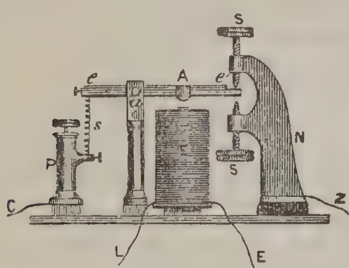


Fig. 5.

being in the line-circuit, the electro-magnet, E, of the relay is included. The coil is long, and of thin wire, and a very faint current is sufficient to develop magnetism in the core. The line-current passes through the coils of E just as it is represented doing through that of the Morse in fig. 1. The armature of the relay, A, is attached to a lever, *ee'*, moving round the axis *a*. When a current is sent through the coil, the lever is drawn down, and the end *e'* rests on the screw S. When there is no current, the elasticity of the spring *s* brings it back against the screw S'. The spring, *s*, is so adjusted that the play of *ee'* may be made as easy or stiff as the strength of the line-current requires. The pillars N and P are connected with the poles of the local battery. The metal spring *s* places the lever *ee'* in conducting connection with P. The poles of the battery may therefore be taken to be the screw S, and the end *e'* of the lever. When these are in contact, the local current flows, and it stops when *e'* is brought back against the insulated screw S'. The Morse is included in the local circuit. When a current comes from the sending-station, the armature, A, is attracted, *e'* falls on S, the local circuit is closed, and the Morse begins to print. When the current ceases, *e'* falls on S', and the style of the Morse is withdrawn from the paper. The effect is thus the same as if the line-current printed, and not the local current. By this means, a current that would have no effect on the Morse, can complete the local circuit, and print most legibly.

How Several Stations are connected in One Circuit.—This is effected in three ways—by an *open circuit* (Ger. *Arbeitsstrom*), by a *closed circuit* (Ger. *Ruhestrom*), and by *translation*. In all of these, each station may telegraph simultaneously to all the stations in the circuit, and if the message concerns them all, a record may be printed at each station. When a station wishes to telegraph to another, it keeps signalling the name till the station in question signals back that he is ready. The others, finding that the message does not concern them, leave the two concerned in possession of the circuit.

The arrangement of an intermediate station in an open circuit is shewn in fig. 6. L_1 and L_2 are the wires from the terminal stations; R is the relay; the rest mean the same as in fig. 3. The station is represented as receiving. The line-current passes through the key, the relay R, and goes on to L_2. The relay sets the local battery and the register in operation. The line-current is brought into the station, and led out without being affected. Electrically, it is the same as if it had gone on in the air direct from L_1 to L_2. When the station sends, the key is depressed. The current goes from C into the line L_1, is earthed at the one terminal station, leaves the earth at the other, and returns to Z by L_2. The battery here has no 'earth,' as at the terminal stations, the arrangement of which is as in fig. 3. An 'earth,' however, is generally put at each station, so that it may be worked as a terminal station if required. R at sending is out of circuit. According to this plan, every station must have a battery as strong as the terminal stations. In the closed circuit, no battery is needed at the intermediate station. If the battery and its connections be removed, fig. 6 gives the arrangement in a closed circuit. The battery may be placed only at one terminal station, or it may be divided into two, and a half put at each end, both, however, being joined up to act with, not against each other. The circuit is closed when no one operates, so that a current constantly flows. The keys breaking the connections stop it for the time. The relays act negatively, making the Morse print when there is no line-current, and be at rest when it flows. If S' in the relay (fig. 5) were uninsulated, and S insulated, it would act in a closed circuit. The advantage of the closed circuit is, that the batteries which require considerable attention are confined to the terminal stations, where they can best be cared for. Besides, little or no adjustment is needed for the relays. In the closed circuit, all the relays are in circuit at once. Open and closed circuits are used in lines where a number of smaller towns are joined together, the business of all of them being no more than sufficient to keep the line working. They are, for short distances, seldom more than 200 or 300 miles.

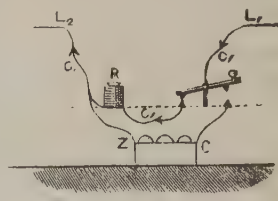


Fig. 6.

When two stations, say 500 miles apart, are to be connected by telegraph, it is seldom done by a direct line, it being found more efficient to transmit to a half-way station, and thence to retransmit to the end one. The retransmission is effected not by manipulative skill, but by mechanical contrivance, so that, while the half-way station may read the message sent, no time is lost in the transmission, and the two end stations and the intermediate station communicate with each other as readily as if they were in an open or closed circuit. This mechanical retransmission is called *translation*. It is effected by making the lever of the register act as a relay in transmitting a message to the next

station. The system, to be fully explained, would require more detail than we can here give to it. We shall only shew how translation can be effected, leaving out of account how all the stations can communicate as in one circuit. We also suppose, for the sake of simplicity, that no relay is needed, and that we are dealing with a direct working register. The current, C_1 (fig. 7), from the sending-station enters the coil of the register M, and goes thence to earth P, and returns as shewn by arrow C_1. The register may record or not, according to the message, but its doing so or not in no way interferes with translation. The copper pole C, of the battery CZ, is connected with the lever *ll′* of the register, and the zinc pole is to earth. When the lever is drawn down by the current C_1, it strikes against the point at the top of the pillar *p*, that checks its motion. The pillar *p* is joined to line L_2, running to the further station, and when the lever falls, a second circuit—viz., that of the battery CZ—is closed, in which C, the lever, the pillar, L_2, the further station, the earth, P, and Z are all included. Thus, as *ll′* prints at the intermediate station, it at the same time sends a new printing-current to the next. When it ceases to print, so does the register at the distant station. It is in this way that parliamentary news is transmitted simultaneously to all the important towns lying between London and Aberdeen. At the shore ends of submarine cables, there is always a translating apparatus. This allows the cable to be worked by a battery suited to it, without loss of time in making it a special circuit.

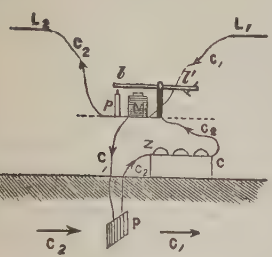


Fig. 7.

Cooke and Wheatstone's Needle Semaphore.—This

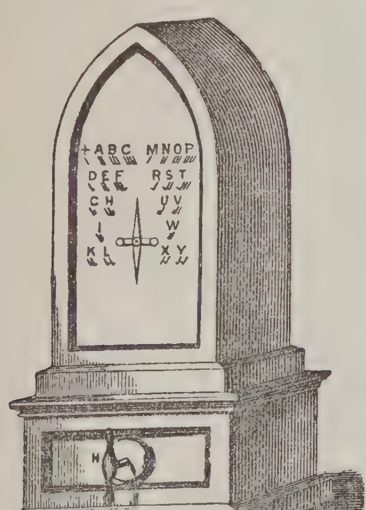


Fig. 8.

consists of an upright galvanometer, with the astatic needles loaded at the lower end, to keep them, when not acted on, in a vertical position. A front view of the single-needle instrument is given in fig. 8. One needle moves within the coil, and the other on the face of the dial. It is the dial needle which acts as the indicator. The alphabetical code is made up by combinations of the right and left deflections of the needle. The old alphabet is given in fig. 8. A is made by two left deflections; M by one right; D by one right, then one left; R by one left, then one right; G by two right, and one left; and so on. The short arm indicates which beat is made first, and the long that made second. The Electric and United Kingdom Companies have adopted an alphabet corresponding to Morse's code, a right-hand deflection corresponding to a dash, and a left-hand deflection to a dot. The instrument is so arranged, that when the handle, H, stands erect, the whole is in the receiving state. When the handle turns to the right or left, the instrument sends, and the needle deflects accordingly to the left or right at both the sending and receiving stations.

Historical Sketch.—Ampère suggested as early as the year 1820 the employment of a galvanometer, lines of wire, and a battery as a means of telegraphing. In 1832, Dr Joseph Henry (q. v. in SUPPLEMENT) first established the fact that mechanical effects could be produced by a galvanic current at a distance operating upon a magnet or needle, and that the telegraph was therefore possible. Gauss and Weber at Göttingen in 1833 suspended about a mile of wire in the air to aid their magnetic operations, using a reflecting galvanometer, with the suspended magnet in the centre of a coil of wire forming part of the circuit. Their alphabet was made up of combinations of right and left reflections. This apparatus, the first ever employed for practical telegraphy, has lately, in the hands of Sir William Thomson, become the most sensitive of all telegraphic instruments. His reflecting galvanometer is the only instrument at present by which a cable 2000 miles long can be worked with low tension (two or three Daniell's cells). It consists of a magnetic needle, only one grain and a half in weight, suspended by a thread without torsion within a sensitive galvanometer coil. A tiny mirror is attached to the magnet, by which a beam of light directed against it is reflected upon a scale at some distance. When no current passes, the reflected ray lights up the zero-point of the scale. When a current is sent, it travels to the right or left according to the message. If earth-currents turn the reflected ray to a point right or left of this true zero, this point may be taken as the zero for the time being, and signals may be sent right and left of it as before. Gauss and Weber's telegraph was merely looked on as a scientific curiosity. It was not till the year 1837 that the electric telegraph promised to become a matter of general and practical importance. In that year, three systems of telegraphy of independent origin were tried, and so nearly at the same time, that all three lay claim to priority. In June of that year, Cooke and Wheatstone patented a five-needle semaphore, or signal apparatus, which was put in action on the Great Western Railway soon afterwards. These inventors have undoubtedly the credit of being the first to construct a line of magneto-semaphoric signals for general purposes. Their lines consisted of underground insulated wires. Cooke derived his first idea from a lecture he heard at Heidelberg given by Professor Munke, in which was described Baron von Schilling's horizontal needle telegraph, said to have been constructed as early as 1832 or 1833. In July of 1837, Steinheil, at Munich, stretched telegraphic wires over the houses of the town from the Physical Cabinet of the Academy to the Observatory of Bogenhausen, about three miles off. He telegraphed in three ways—by the

deflections of a needle, by the sounding of two bells of different tones, and by printing a strip of paper. In October of 1837, Professor Morse exhibited his automatic recording telegraph, 1½ miles in extent. Morse's system is in universal use, except in Great Britain. Steinheil's printing system is also extensively employed, more especially on the continent. Steinheil's system of printing is different from Morse's; positive and negative currents print each a different mark. In Morse's system, either current prints indifferently. Steinheil's alphabet consists of dots to the right and left of the strip of paper. It is thought that the telegraphing by right and left dots can be done more quickly than dots and dashes in a line. In 1838, Steinheil discovered the efficacy of the earth-circuit, and the need of only one wire. To Steinheil also belongs the merit of being the first to stretch wires in air on insulating supports, and to shew the applicability of magneto-electricity to telegraphic purposes. Cooke and Wheatstone patented the first step-by-step telegraph in 1840. This invention was worked by voltaic or magneto-electricity. In 1846, Bain patented his electro-chemical telegraph. In this instrument, a piece of paper, moistened with an acidulated solution of ferrocyanide of potassium, is laid on a revolving plate of metal under a steel point pressing gently on it. As the current passes through the paper from the point to the plate, it marks it with blue dots or dashes, as in Morse's system. No relay is needed. This system, to all appearance one of the most simple and delicate, has never come into permanent use. Morse's telegraph did not come into practical use till 1844, when it was used on the first American line between Washington and Baltimore. The first successful submarine cable was laid between Dover and Calais in 1851. Faraday first announced the effects of lateral induction in 1854. The telegraph was completed by the Persian Gulf to India in 1865. The first Atlantic cable was projected by Cyrus W. Field, of New York, and was successfully laid August 5 1858, after a failure in the previous year, and ceased to work on September 1 of the same year, having transmitted 400 messages. The energy of Field restored confidence, and another cable was made and laid down in July 1865, but after 1200 miles were deposited it was lost. In 1866 another was made, and in July it was successfully laid down. In August the lost cable was found and spliced, and carried to the western shore, and thus two Atlantic cables were finally established. A French cable was completed, July 23 1869, from Brest to the island of St Pierre, near the Gulf of St Lawrence, and continued to Duxbury, Mass. During the month of March 1871, 12,547 messages were transmitted across the Atlantic, or about 405 per day. The companies, in 1870, paid from 7 to 9 per cent. dividends, but laid by no reserve fund. In 1865 the cable line overland through Alaska and Siberia was projected, but on the successful raising and operating of the transatlantic cable it was abandoned.

Statistics.—There are two systems of telegraphy—the government, now in operation in every state in Europe with very decided advantage, and the corporate, which is still in operation in the United States. The first seeks the interest of the people, the last of the stockholders primarily and of the people secondarily. Low rates ot despatch consequently prevail in Europe, and high ones in America. In France, there are 1700 telegraph stations, with 24,000 miles of line and 100,000 miles of wire, which transmit 4,000,000 messages a year, at an average rate of 10 cents per 20 words to all parts of the country. Prussia in 1867 had 45,272 miles of wire in operation, and transmitted telegrams at an average rate of 22½ cents for 20 words. In Belgium and Switzerland, messages are sent at a charge of 10 cents for 20 words. In the former state, a reduction of 50 per cent. in the tariff charges has produced an increase in the despatches of 85 per cent. In Norway, the telegraph is applied to a novel use. The fishing grounds extend about 1200 miles along the coast, and, by means of semaphores and movable telegraph offices, the approach of fish arriving in immense shoals is instantly signalled inland and elsewhere, greatly to the advantage of her 40,000 fishermen. In 1866, Great Britain had 15,378 miles of line in operation, and 73,361 miles of wire, which cost £2,413,582. The conduct of the telegraph in Great Britain proving unfavourable to the public interests, the government assumed the control of it in February 1870, and has conducted it with eminent success. The low tariff of charges, vast increase of offices, and general regard for the public convenience have proved the wisdom of the change. The total amount of stock created under the telegraph act of 1869 for their purchase during 1870, was $37,000,000. The gross earnings for 1870 amounted to $3,992,900, and the working expense to $2,350,000. In 1868, a number of important treaties were concluded between most of the states of continental Europe for the purpose of extending and popularising telegraphic correspondence. In the United States there are about 5000 telegraph stations, 75,000 miles of line, 7000 employees, and over 11,500,000 messages annually; of this the Western Union Company own 52,099 miles of line and 104,000 miles of wire, which probably cost about $10,000,000, though they have been nominally valued at $45,700,000; the remaining lines probably about $3,000,000. The Western Union Company employ about 6000 operators, and receive annually about $5,000,000. The cost of American despatches averages 71 cents—in nine countries in Europe, 40 cents. While to the genius of one American citizen, and the industry and enterprise of another, the world is indebted for the practical introduction of the electric telegraph, the United States is far behind the states of Europe in furnishing the people with a cheap, swift, reliable, and comprehensive system of telegraphy. A committee of Congress, on July 5 1870, recommended the incorporation of a postal telegraph company, to be under the control of the government, in imitation of the British postal telegraph system, and a bill was prepared, which has not yet become a law. See Catalogue of Works on Telegraphy in *Examination of Telegraphic Apparatus*, by S. F. B. Morse, in *Rep. of Amer. Com. to Paris Exhib.* 1867, Washington, 1869.

The continent of Europe, from one end to the other, forms one vast network of telegraphic lines. The stations in Great Britain, numbering about 4000, are in connection with that number (the principal stations) on the continent. Europe and Africa are connected, through Corsica, Sardinia, and Sicily, by a cable with Algiers, and by another touching at Malta with Alexandria. Into Asia the European system penetrates by St Petersburg as far as Irkutsk in Siberia, and by Constantinople and the Persian Gulf to Calcutta. In France, the tariff adopted is ½ franc for messages within the department, and 1 franc to other parts of the country. Autographic messages sent by Caselli's telegraph, which was adopted in 1865, are charged at the rate of 20 centimes for each square centimètre. In the United States, before the establishment of the British postal system, the telegraph was more a matter of every-day use than in Great Britain. Compared with the population, America then sent almost three times the number of telegrams sent in Great Britain. There is a line of telegraph between New York and San Francisco, across the continent, connecting the shores of the Atlantic and Pacific. On the day of the funeral of President Lincoln, 75,000 words were telegraphed from Washington to New York, 70,000 of which were sent between 7 o'clock at night and 20 minutes past 1 in the morning. See *Exam-*

ption of Telegraphic Apparatus, &c. at the Paris Exhib. 1867, by S. F. B. Morse, Washington, 1869.

TELE'MACHUS, son of Odysseus (see ULYSSES) and Penelope (q. v.), was an infant when his father left home to join in the war against Troy, but during the latter's long absence of about 20 years grew into manhood. At the instigation and under the guidance of Athene (Minerva), who had assumed the appearance of Mentēs (commonly known as Mentor, Lat. 'the thoughtful one'), king of the Taphians, his father's dearest friend, T. set out in search of his long-lost sire, after having vainly endeavoured to eject his mother's troublesome suitors from the house. Having visited Pylos and Sparta, at both of which places he was most hospitably entertained, T. returned home to Ithaca, where he found his father in the guise of a beggar, living with the swineherd Eumæus. After mutual recognition, father and son proceeded to slay the suitors.—In modern times, T. is known chiefly as the hero of Fénelon's (q. v.) romance, *Télémaque*, which is an account of the adventures that he is supposed to have met with in the search after his father, and under the guidance of Mentor, who acts to him the part of 'guide, philosopher, and friend.' This work was once very popular as a school-book both in Britain and on the continent.

TELEO'LOGY, the doctrine of ends, is derived from the Greek *telos*, an end, a word brought into philosophic discussion by Aristotle. The idea of an end entered into the Aristotelian conception of physical science, but more properly into ethical science or morality. All the ancient systems of morality, from Socrates downward, correctly regarded it as a *practical* science; they started with the inquiry, 'What is the proper and final end of all human conduct?' and the answer given by each school was the characteristic doctrine of the school. Aristotle answered, 'Happiness, in a peculiar sense;' the Stoics said, 'A regard to the whole universe of being;' the Epicureans, 'Pleasure and the absence of pain.' John Stuart Mill, in the concluding chapter of his *Logic*, entitled, 'The Logic of Practice, or Art; including Morality and Polity,' adopts the ancient point of view, and observes that there should be a science of ends, or a reasoned statement of the final purpose of all human action; for this science he suggests the name Teleology, remarking that it corresponds to what the Germans call the practical reason. There would be comprehended under it, the art of living or happiness, taste or the beautiful, morality, and politics. See CIVILISATION. The word Teleology is applied to the argument from design in proof of the Deity. This is in keeping with Aristotle's employment of the word in physics. When a natural philosopher assigns the purpose or end of any natural arrangement, as the offensive or defensive weapons of an animal, he is said to give a teleological explanation.

TELEOSAU'RUS, a genus of fossil crocodiles, the remains of which occur in the Oolitic rocks. They are found associated with marine fossils, and the peculiar modification of their skeleton seems to have specially fitted them for an aquatic life. Both surfaces of the vertebræ were slightly concave, the hind-legs were large and strong, and the anterior portion of the body gradually tapered into the long and slender jaws, giving the animal the aspect of the gavial of the Ganges, only the jaws were more attenuated, and the nasal aperture, instead of being oblique, opened vertically on the truncated end of the upper mandible. The jaws were armed with numerous equal and slender teeth, slightly recurved, and admirably adapted for the capture of fishes, with which the Oolitic seas abounded. No less than twenty species have been described, and these present so many striking differences, that they have been arranged under six sub-genera.

TE'LEPHONE. This is an instrument invented by Reis of Frankfurt, in 1861, to telegraph musical sounds. It is well known that when a rod of soft iron is placed in a coil of wire, it is magnetised when a current is sent through the coil, and demagnetised when the current ceases. A distinct sound like a tick accompanies the demagnetisation. There is apparently no limit to the rapidity with which this can be obtained. Each break in the coil circuit produces this tick, however rapid one may follow the other. Reis places an iron rod and a coil at the receiving station; and by means of a tight membrane made to vibrate by the sound of the human voice or other musical instrument at the sending stations, he produces as many interruptions in the circuit and ticks of the rod as there are vibrations in the various notes. The reproduced notes, though of the same pitch, are not of the same quality as the transmitting notes. They are very faint, and resemble the sound of a toy trumpet.

TELE'PHORUS, a genus of coleopterous insects, of the sub-order *Pentamera*, and section *Serricornes*. The body is long, narrow, depressed, soft, and somewhat flexible. The species are numerous, and some of them abound in Great Britain and the state of Pennsylvania in summer, chiefly in meadows and pastures. The larvæ dwell in moist earth, and devour small insects and their larvæ. The perfect insect feeds on similar food.

TELE'RPETON, a remarkable genus of fossil reptiles, the relics of which have been found in fine-grained whitish sandstone quarried at Cummingston, near Elgin. A single specimen was long all that had been detected; but a second is now known. The first exhibits the skeleton complete, with the exception of the termination of the tail, but the bones have disappeared, and left only the casts as dark-coloured cavities in the pale gray rock. Nearly perfect casts of their form were taken by Dr G. Mantell from these hollow casts. The impressions are so well defined as clearly to shew that there were twenty-six vertebræ between the skull and the sacrum, two sacral vertebræ, and the portion of the tail preserved on the slab consists of thirteen others. The ribs, of which there are twenty-one pair, are very slender; they are short near the head, but quickly lengthen as they leave it. The reptilian nature of this fossil is evident. By Dr Mantell it was considered to be a batrachian, and described as *Telerpeton Elginense;* but Professor Owen has more correctly referred it to the lacertine type, because of the numerous ribs, the structure of the sacrum, and the form of the pelvis. He has named it *Leptopleuron lacertium.*

In the same quarry where it was found, the foot-prints of an animal with a stride of about four inches have been found, and it is very probable that these were produced by the *Telerpeton*, which was nearly five inches long.

This little reptile derives its great geological importance from its reputed antiquity. The rock quarried at Cummingston was referred to the Old Red Sandstone measures, and for several years the *Telerpeton* was looked upon as the earliest quadruped that the geologist had discovered. Its great antiquity has, however, been disproven, because other reptilian remains found in the same beds are allied to Triassic forms, and Huxley has shewn it to be related to other Triassic reptiles of Europe, which he regards as *Lacertilia.* Cope has proven that all these Triassic forms belong to the order *Rhynchocephalia*,

which has an existing representative in the *Sphenodon* of New Zealand.

TE'LESCOPE (Gr. *tēle-skopos*, far-seeing) consists essentially of a lens or mirror, to form, within our reach, an image of a distant object; and a Microscope (q. v.), to examine this image in detail. Its invention is ascribed to various individuals living about the end of the 16th c.; but there is no doubt that Galilei (q. v.) was the first to apply it to any purpose other than the gratification of mere curiosity.

The space at our disposal will not allow of our entering into any minute details, so we propose to give, *first*, a general idea of the mode in which a telescope acts, in the course of which we shall incidentally shew how the magnifying power and the brightness of the image depend on the dimensions of the various parts of the instrument; *second*, to point out the various causes of imperfection, which in all telescopes are unavoidable, and how these are reduced to as small an amount as possible; *third*, to mention the most important of the many forms which have been devised, and the processes by which these delicate instruments are practically constructed.

When a lens is employed, as in a camera obscura, to form an image of an object, as AB in fig. 1,

Fig. 1.

the distance of the image from the lens depends on the focal length of the lens, and also on the distance of the object. Practically, with telescopes, the distance of the image from the lens is, on account of the remoteness of the object, the focal length of the lens. Also the image of any point, A, of the object lies in the prolongation of the line joining A with the centre, C, of the lens. Join AC, and produce it to *a*, C*a* being made equal to the focal length of the lens, *a* is the point at which the

Fig. 2.

image of A is formed. Similarly at *b* the image of B is formed. Thus the image is *inverted;* and, seen from C, the image and the object subtend equal angles, or look equally large. When a concave mirror forms an image, the effect is as in fig. 2, where C is now the centre of the sphere of which the mirror is a portion. When the object, AB, is at a great distance, the image, *ab*, is *inverted*, and is formed half way between C and the mirror. As before, object and image subtend equal angles at C. In order to see these images, the eye must be placed at some such point as E in each of the figures.

So much for the formation *within our reach* of an image of a distant body. We must next shew the action of a lens when employed to magnify this image. When an object, as *ab* in fig. 3, is placed rather nearer to a lens than its focal length, rays which pass from the object through the lens appear to have come, not from the object, but from an enlarged image as $\alpha\beta$, at a greater distance from the lens—but subtending, as before, the same angle at the centre, *c*, of the lens. In practice, the lens is so adjusted as to form the image, $\alpha\beta$, at a distance of about ten inches from *c*, in which case the eye sees it most distinctly, and the distance of *ab* from the lens is then (practically) the focal length of the lens.

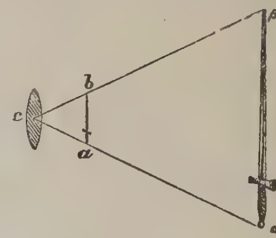


Fig. 3.

We now combine the first and third diagrams, and we have the *Common Astronomical Telescope.* The magnifying power is obviously to be measured by the increase in the angle which is subtended by the image, $\alpha\beta$ (fig. 4), over that which is subtended by the object, AB. The angle at C is the measure of the apparent size of the object; that at *c*, of the apparent size of the image. And it is easy to see from the quadrilateral C*acb* in the figure that these angles are inversely as the sides C*a* and *ac*. (For instance, if C*a* have six times the length of *ac*, the angle at C will be only one-sixth of that at *c*.) Hence the magnifying power is to be found by dividing the focal length of the object-lens by that of the eye-lens. In practice, the lenses are so mounted in tubes that their distance may be increased or diminished at pleasure. When the object, AB, comes nearer the observer

Fig. 4.

its image, *ab*, is formed *further* from the lens C. Hence, for near objects, the telescope requires to be pulled out. Again, the distance of most distinct vision differs for different people, so that even when AB is at a fixed distance, short-sighted and long-sighted eyes require the eye-lens to be removed from, or advanced to, *ab*, so that for each eye $a\beta$ may be formed at the distance at which it can be most distinctly seen.

To estimate the relative brightness of the image

and object, suppose, for simplicity, all the light which enters the telescope from the object to reach the eye. Then the quantity of light which enters the eye from the image, is greater than that which would enter the unaided eye from the object, in the ratio of the aperture of the object-glass, C, to the aperture of the pupil of the eye. But it is spread over a magnified image. If the image be as much larger than the object as the object-glass is larger than the pupil of the eye, the object and image will appear equally bright. Taking the aperture of the pupil as $\frac{1}{10}$th inch, the object-lens would require an aperture of 10 inches, with a magnifying power of 100 times, in order that brightness should not be lost. Practically, the most formidable difficulty in attaining very high magnifying powers, is that due to the enormous sizes of lenses and mirrors which are required to give the necessary brightness to the enlarged image. It is easy to see that it is impossible to render the final image brighter than the object, by any increase of dimensions in the object-lens.

After what we have said about the common astronomical telescope, the reader will have no difficulty, from a combination of figures 2 and 3, in understanding the construction of the Newtonian or Herschelian reflecting telescope.

We proceed to the second part of our proposed scheme of treatment of the subject, viz., the unavoidable imperfections of the telescope, and their reduction to a minimum.

In the first place, then, even with a mirror—where we are not annoyed by the breaking up of white light into its component colours, since the Law of Reflection (q. v.) is the same for all rays—it is impossible to form a perfectly sharp image of more than *one* definite point at a time. In order to do even this, the mirror must be formed as part of the prolate spheroid produced by the rotation, about its longer axis, of an Ellipse (q. v.), one of whose foci is the object-point, the other the image. If the object-point be, like a star, practically at an infinite distance, the requisite form of the mirror is that formed by the rotation of a Parabola (q. v.) about its axis. The axis of the mirror must then be directed to the object-point, and all rays from it will, after reflection, pass accurately through the focus. But this is not strictly true for any other object-point in the field of view, although so nearly true that no inconvenience is practically found to result from it. But, if the mirror used be part of a sphere, no point can be found such that rays diverging from it shall all be brought after reflection accurately to one point of the image; and this defect, called *Spherical Aberration*, increases proportionally to the surfaces of the mirror; so that by increasing that surface, for the attainment of brightness, we increase proportionally the indistinctness of the image. To give an idea of the delicate manipulation required in the construction of a reflecting telescope, we take the case of a speculum of 4 feet aperture and 40 feet focus, as calculated by Sir J. Herschel. If this be first ground to a truly spherical form, it must have a radius of 80 feet, as we have seen above. Now, such a mirror will give a very indistinct image, even under the most favourable circumstances; yet to grind it to the parabolic form, which is practically perfect, leaving the middle untouched, and grinding more and more away from its surface as we proceed outwards to the edges, even at the edges we have to remove a film of metal of only the $\frac{1}{21,333}$d part of an inch, somewhere about the $\frac{1}{100}$th part of the thickness of the paper on which this is printed!

Lenses, whether the object-lens or the eye-lens, have this defect also; but, as a rule, the spherical aberration in lenses is almost negligible compared with *Chromatic Aberration*, which arises from the different refrangibilities (see REFRACTION) of the various coloured rays; and leads to the formation, by a lens, of a separate image of a bright object for each coloured ray. The remedy consists in *achromatising* (see ACHROMATIC, REFRACTION) the lens—i. e., forming it of two or more lenses of different kinds of glass—so that the colours, separated by one, shall be reunited by the others. With a double achromatic lens, in which a convex lens of crown-glass is united to a concave of flint-glass, the focal lengths of the separate lenses can be easily adjusted so as to bring, when in combination, any two assigned rays of the Spectrum (q. v.) simultaneously to a focus; and, by a judicious selection of these two rays, we may reduce the consequences of irrationality of dispersion (see REFRACTION) to a minimum. But this is not all. To construct a lens of a given material which shall have a given focal length, is an *indeterminate* problem; we may assign the curvature of either surface at pleasure, and then that of the other is definite, and can be calculated. Thus, the achromatism of a double-lens can be secured in an infinite variety of ways, and we may impose further conditions; i. e., that the curvatures of the convex and concave surfaces shall be adjusted so as to destroy as far as possible the spherical aberration. Other imperfections, such as those due to DIFFRACTION (q. v.), &c., cannot be here more than alluded to, as they do not admit, within any reasonable limits, of being popularly explained. Nor can we enter upon questions connected with the correction of chromatic and spherical aberrations in eye-pieces, which is effected by the combination of two or more lenses (generally of the *same* material) placed at a certain distance from each other. We may only mention that the defect (for terrestrial purposes) of the common astronomical telescope, the inversion of the image, is overcome by combining two such telescopes, the smaller to examine the image formed by the larger, and therefore to reinvert it. This practically comes to constructing the eye-piece of three lenses at a distance from each other; though, for greater distinctness, four are usually employed.

In the earliest, or Galilean, telescope, the eye-lens is concave; a construction only now used in opera-glasses. It has far less chromatic and spherical aberration than the common astronomical telescope, and is shorter, since the distance between the lenses is the *difference*, not the *sum* of their focal lengths; but it has a very serious defect in the smallness of its field of view. This can only be enlarged, as in opera-glasses, by making the diameter of the object-lens disproportionately great.

Before the discovery of the possibility of forming an achromatic lens, Huyghens, Cassini, and others, had endeavoured, by enormously increasing the focal length of the object-glass of the common astronomical telescope in proportion to its diameter, to get rid as far as possible of chromatic aberration. This was called the *aërial* telescope, as the object and eye lenses were mounted separately on stands; the tube (which would have been 100, 200, or even 600 feet long) being dispensed with. Valuable work was done with some of these telescopes, of 125 feet focus, but the longer ones proved unmanageable. The principle involved in these constructions is, practically, the throwing the magnifying power more on the object-lens than on the eye-lens; as the image formed by the former was still so imperfect as not to bear much additional magnification; although achromatic eye-pieces could even then be made with one kind of glass. The great step required for shortening the unwieldy instrument was therefore the perfecting of the object-lens. We have already seen how this was effected. Various very ingenious

improvements on achromatic combinations, even yet (we should be inclined to think) worthy the consideration of opticians, were devised by Dr Blair. He obtained in solutions of mercury or antimony in hydrochloric acid, media, in which, while much more refractive and more dispersive than crown-glass, no irrationality of dispersion as compared with crown-glass could be detected. With these fluid lenses he was enabled to give the telescope an aperture of ⅓d of its focal length without a trace of residual colour. The *dialytic* telescope, invented in 1828 by Mr Rodger, and since made by Plössl, seems to promise very well. Its object is to obtain a large aperture for the telescope with a flint-lens (the obtaining of which, in large and perfect discs, is the great difficulty) of moderate size. In this telescope the object-lens is single, and of crown-glass; having, of course, all the defects of the single lens. These are corrected, at some distance in the cone of converging rays, by the interposition of a combination of a pair of much smaller lenses, whose focal lengths are equal for red rays; the first being a convex lens of crown, the second a concave of flint, glass. The adjustments of this instrument for exact correction are, a motion of the pair of lenses to or from the object-lens, to correct chromatic aberration; and a change of the distance between the two smaller lenses, to correct spherical aberration.

Chromatic being so much more serious than spherical aberration, it is not to be wondered at that the idea of substituting an object-mirror, in which the former is absent, for an object-lens, was early suggested. The first practicable scheme for the purpose seems to have been that of Gregory; in which, however, two mirrors are employed. In the skilful hands of Short, this instrument completely superseded the ordinary astronomical telescope. Its chief defects are, the great loss of light by two direct reflections, and the increase of the spherical aberration by the fact that both mirrors are concave. The first defect is incurable, the second was partially overcome by Cassegrain's plan of using a small *convex* mirror for the second reflection. To Newton is due the simple idea of using the combination of a single curved mirror with a plane mirror and an eye-piece; a construction differing only in slight particulars from that now universally adopted for reflecting instruments. Newton constructed several such telescopes with his own hands, some of which are still preserved, as in the apartments of the Royal Society at Burlington House.

The elder Herschel constructed for himself all the instruments, gradually increasing in magnitude and optical power, by means of which he made his grand discoveries; and his son worthily succeeded him, both as constructor and observer.

The gigantic telescopes of Lord Rosse and Mr Lassell are wonderful examples of delicate art, and have had their full share with the large achromatics of Alvan Clark of Boston in the startling discoveries of modern astronomy.

The process of Liebig for depositing on glass an exceedingly thin film of silver, which, by careful polishing, can be rendered more highly reflective than any other material, has been taken advantage of by Steinheil in the construction of large specula. This is an immense step, since any disc of glass will do, its optical properties not being employed; while, if it be once brought to a true parabolic figure, the silvering may be renewed as often as may be required. One of the great difficulties in the construction and working of large reflectors has hitherto been the casting and annealing of metallic masses of a few tons' weight. This, in the silvered specula, is entirely avoided. We cannot here enter into a description of the processes, often extremely ingenious, which have been devised for the grinding, figuring, and polishing of lenses and specula. The reader who desires strictly scientific information, conveyed in a thoroughly popular form, on this and all other points connected with the subject, is referred to Sir John Herschel's article 'Telescope,' in the *Encyclopædia Britannica.*

TELEURASPIS, a genus of arboreal crotaline serpents, near the Copperheads, from Central America.

TELFORD, Thomas, an eminent engineer, was born in the parish of Westerkirk, in Eskdale, Dumfriesshire, 9th August 1757. His father was a shepherd; and during the intervals of his attendance at school, young T. followed the same occupation, diligently employing his leisure moments in the perusal of whatever books were within his reach. At the age of 14, he adopted the trade of a stone-mason; and long years afterwards, when he had attained the summit of his profession, he confessed the advantages which he derived during this period from 'the necessity of making himself acquainted with every detail in the procuring, preparing, and employing of every kind of material, whether it be the produce of the forest, the quarry, or the forge.' In 1780, he removed to Edinburgh; and in 1783, he repaired to London, obtaining employment under Sir William Chambers, who was then engaged on his chief work, the erection of Somerset House. T.'s merits attracted the notice of his employer, and he was appointed in 1784 to superintend the erection of the resident commissioner's house at Portsmouth dockyard, a work which lasted over three years, and afforded T. the opportunity, of which he fully availed himself, of mastering the details of construction of docks, wharf-walls, &c. In 1787, he was appointed surveyor of public works for Shropshire; and his two bridges over the Severn at Montford (3½ miles west-north-west of Shrewsbury) and Buildwas (1½ miles west of Coalbrook Dale), a large number of minor bridges, and other county works, testified to the genius and industry of the rising engineer, and gained for him the planning and superintendence of the projected Ellesmere Canal, 103 miles in length, to connect the navigation of the Severn, Dee, and Mersey—a work which occupied ten years (1795—1805), and greatly added to the already eminent reputation of Telford. In 1790, he was appointed by the British Fishery Society to inspect the harbours at their various stations; and in 1801 he received a commission from government to report on the state of Scotland, and on the desirable public works for that country. As a consequence, the plan of a canal from Inverness to Fort-William was revived, and its planning and construction intrusted to T. (see Caledonian Canal). In the same capacity of engineer to the parliamentary commission of roads and bridges for Scotland, he executed more than 1000 miles of road in the Highlands, Lanarkshire, and Dumfriesshire (see Road-making), and erected about 1200 bridges, besides churches, manses, harbours, &c. In 1808 and again in 1813, he was invited to Sweden, to report on the projected scheme for connecting Lake Wener with the Baltic, and superintended the construction of the Gotha Canal, by which this was effected, receiving on his departure numerous and valuable marks of the royal approbation. His next great work was the construction of the road from London to Holyhead, including the erection of numerous bridges—among others, of the Menai *Suspension Bridge* (q. v.)—and the last was the execution of the St Katharine's Docks in London, a work of remarkable merit. His other works are far too many to enumerate. We can only afford to state that, of bridges, the Conway (q. v.), the Broomielaw at Glasgow, the Dean in Edinburgh, the Over at Gloucester (an innovation on the ordinary form); of

canals, the Glasgow and Paisley, the Macclesfield, the Birmingham and Liverpool Junction, the Gloucester and Berkeley, the Weaver system, the great tunnel ($1\frac{2}{3}$ miles long) on the Trent and Mersey; of harbours. Peterhead, Banff, Fraserburgh, Fortrose, Cullen, and Kirkwall—were planned by this indefatigable genius, and wholly or partially erected under his superintendence. He was much employed by parliament to report on all public engineering schemes or works of importance, and was also occasionally consulted by the Russian government. For the last few years of his life, he retired from the active duties of his profession, employed himself in collecting and arranging materials for a complete history of his various works, and had the greater portion of the MS. ready when he was seized with a severe bilious attack, and died at Abingdon Street, Westminster, 2d September 1834. His life, entitled *The Life of Thomas Telford, Civil Engineer, written by himself*, was published in 1838, in 1 vol. 4to, accompanied with a companion volume of plates. While a mason in Dumfriesshire, he was known favourably as a writer of short poems, in the homely dialect of his district, which are to be found in the appendix to his autobiography. He completed his imperfect school education during the intervals of business, becoming an excellent linguist, and contributed to the *Edinburgh Encyclopædia*. He was elected a member of the Royal Society of Edinburgh in 1803, and of its more eminent southern sister in 1827.

TELL, a district in the extreme north-west of Africa, stretches along the shores of the Mediterranean, and comprehends the corn-growing tracts extending south from the Mediterranean to the Atlas Mountains, and from west to east through Morocco, Algeria, and Tunis. The T. is noticed under the articles Africa and Sahara (q. v.).

TELL, William, was, according to Swiss tradition, a patriot who, in the 14th c., rescued his native district from the tyranny of the House of Austria. His story has been variously told, but that version which has found the widest currency is the following. In the beginning of the 14th c., Albert I. of Austria was striving to annex the three Waldstädte, Uri, Schwyz, and Unterwalden, to his family estates. Hermann Gessler, his bailiff (or *Landvogt*), lived at the castle of Küssnacht, and perpetrated on the people of the district the most atrocious cruelties. A league was formed of the principal men of the Waldstädte to resist the Austrian pretensions, and to it belonged Walter Fürst, and William Tell, his son-in-law. Among other acts of tyranny, Gessler placed the ducal hat of Austria on the top of a long pole, erected in the market-place of Altorf, and gave orders that no one should pass without uncovering his head. T. and his little boy one day took no notice of the hat, and were at once dragged before Gessler. He, hearing that T. enjoyed great reputation as a cross-bowman, resolved to make his skill a means of punishing him. He was ordered to shoot an apple from his son's head, and told that if he missed it, he should die. To the amazement of all present, he hit the apple without injuring the child. But this did not satisfy Gessler. Turning to T., he asked him what he meant to have done with a second arrow he had in his girdle. 'To have shot you, if it had slain my son,' was the reply. T. was then seized, bound, and thrown into a boat on the Lake of Lucerne, to be taken with Gessler and his men to the castle of Küssnacht. A sudden Alpine storm sprung up. T. was the only man on board who knew the shore, and could manage a boat in such weather. He was allowed to take the helm, and he soon ran her towards a rocky ledge; he there seized his bow and arrows, sprang on shore, and pushed the vessel back into the water. The storm, however, abated, and Gessler and his party landed. T. lay in wait for them in a rocky defile, and as they passed, he shot Gessler through the heart. This befel in 1307, and the great war of the Swiss against Austria followed, which did not terminate till 1499. T., however, is not said to have taken any prominent part in it. He was drowned, it is added, in 1350, in attempting to save a friend during a great flood of the river Schächen.

There is evidence that, in 1387, a religious service was instituted to commemorate the act of T. at the place where he lived; and that, in the following year, Tell's Chapel was built on the spot where the boat was said to have landed. Russ and Etterlin, chroniclers who lived towards the end of the 15th c., told his story as true history. Tschudi, who wrote in the first part of the 16th c., repeated it in the form in which it is now familiar to us, and in which it was adopted by Schiller, in his well-known drama. So early as the end of the 16th c., however, doubts were expressed of its authenticity. Guilmann, who wrote a book, *De Rebus Helveticis*, called in question the very existence of Tell. What, he asks, has become of his family and relatives? Why was he not spoken of by his contemporaries? Grasser, the author of a Swiss *Heldenbuch*, pointed out a striking resemblance between T. and Toke, the hero of an old Scandinavian fable, recorded by Saxo Grammaticus. From that period, incredulity became general, and several books were published to shew that the story was legendary. One of these, *Guillaume Tell; fable danoise*, was burned by the public hangman at Uri, and then a patriotic feeling was manifested on the subject, which, it is believed, made Swiss writers, including J. von Müller the historian, cautious in expressing farther doubt. Voltaire, in speaking of T., makes the remark, that '*ces histoires de pommes sont toujours suspectes*,' and asserts that no part of the tale had a foundation in fact. His opinion became known all over Europe, and since then, a whole library has been published on the story of T., in Switzerland, Germany, Denmark, and France. The most important works, however, bearing on the question, are (1) Ideler's work, *Die Sage vom Schusse des Tell*, published at Berlin in 1826, in which it is shewn that the incident of the apple is purely legendary; (2) an edition of Russ's Chronicle, edited, in 1834, by M. Schneller of Lucerne, in which it is proved that serious disparities exist between the different versions of the story as told by the Swiss chroniclers; and (3) a work containing a series of documents relating to early Swiss history, published in 1835 by M. Kopp, also of Lucerne, in which it is as satisfactorily shewn that, although a continuous series of charters exist relative to the bailiffs of Küssnacht in the 14th c., there is no Gessler among them. T. is nowhere mentioned in contemporary records; but it need not, therefore, be inferred that an obscure peasant did not exist of the name, who shot an Austrian bailiff on the banks of the Lake of Lucerne, who by this act caused a revolt, and who lost his life in attempting to save that of a friend. If such incidents really occurred—and from the early foundation of Tell's Chapel, and other facts connected with it, we must presume they did—it would be easy to explain how they became connected with the old fable of the tyrant, the bowman, and the apple.—Ample information on the Tell controversy will be found in Hisely's *Recherches Critiques sur l'Histoire de Guillaume Tell* (Lausanne, 1843).

TELLEZ, Gabriel, better known by his literary pseudonym of *Tirso de Molina*, a Spanish dramatist

of great reputation, was born at Madrid in 1585, became a monk in 1620, and died in 1648, prior of the order to which he belonged. T. was a friend and pupil of Lope de Vega, whom he almost rivalled in facility of execution. In the preface to his *Cigorrales de Toledo* (1621), a collection of novels and comedies, he reckons the number of the latter composed by him at 300; of which, however, only 68 have come down to us. Besides these, he wrote several Interludes, a great number of *Autos Sacramentales*, an *Acto de Contricion en Verso*, and a *Genealogia de los Condes de Sástago* (Mad. 1640). T. ranks next to Calderon and Lope de Vega as a dramatist. Although he generously affected to consider himself only a follower of the latter, he is really one of the most decisively original geniuses of his country, and imitated Lope in nothing except in cultivating the same national spirit in literature. His plays, deficient in artistic conception, are full of dramatic vitality. The 'situations' are numerous and captivating; the delineation of character fresh, piquant, and vigorous; the wit abundant, and the language richly poetical.—The best edition of T.'s works is that of Don Juan Eugenio Hartzenbusch, in the *Teatro Escogido* (12 vols., Madrid).

TELLICHERRY. See SUPPLEMENT in Vol. X.

TELLING FORTUNES is a criminal offence when accompanied with begging of money or with fraudulent objects. Every person going about pretending or professing to tell fortunes, or using any subtle craft, means, or device, by palmistry or otherwise, to deceive and impose on Her Majesty's subjects, is deemed in law a rogue and vagabond, and may be committed to the house of correction for three months, with hard labour, by a justice of the peace.

TELLI'NIDÆ, a family of lamellibranchiate molluscs; having the mantle widely open in front; the foot tongue-shaped; the siphons separate, long, and slender; the shell usually equivalve and shutting close, the hinge toothed. The species are very numerous, and are found in almost all seas, mostly living in sand or sandy mud, some of them at a considerable depth. The fossil species are also numerous, and are found in the more recent formations. The genus *Donax* belongs to this family.

TELLU'RIUM (symb. *Te*, equiv. 128, spec. grav. 6·183) is one of the chemical elements, which some authorities place among the metals, and others among the non-metallic bodies or metalloids. Although in its outward characters it closely resembles the metals, its close analogies with sulphur and selenium indicate that its true place is amongst the metalloids. It possesses a high metallic lustre, and resembles bismuth in colour; it fuses at about 850°, and at a higher temperature is converted into a yellow vapour; it is a bad conductor of heat and electricity. When strongly heated in the air, it burns with a blue flame, and gives off white fumes of tellurous acid. Like sulphur and selenium, it is soluble in cold oil of vitriol, to which it gives a fine purple-red colour, and on dilution it is precipitated unchanged; and in these respects it differs from all metals. In nitric acid it dissolves with oxidation.

Tellurium forms two compounds with oxygen, viz., *Tellurous oxide* or *anhydride*, TeO_2, and *Telluric oxide*, TeO_3. *Tellurous hydrate* or *Tellurous acid* (H_2TeO_3) exhibits very slight acid properties, and is in the form of a light earthy powder having a bitter metallic taste. Its salts also have a metallic taste, and are said to act powerfully as emetics. *Telluric acid* (H_2TeO_4) has only a feeble affinity for bases. Most of the tellurates are insoluble and are obtained by precipitation. Tellurium unites with hydrogen to form telluretted hydrogen, TeH, which is a gaseous body, analogous to sulphuretted hydrogen, and precipitates most of the metals from their solutions in the form of tellurides, which have a close analogy with the corresponding sulphides.

In experimenting upon the action of the salts of tellurium, it has been found that they possess the power of forming, in the body of a healthy person, compounds which impart to the breath, to the perspiration, and to the gases generated in the intestinal canal, a disgusting fœtor, which makes him a nuisance to every one he approaches; and this smell may last for weeks, although the quantity of tellurium that was administered did not exceed a quarter of a grain.

Tellurium is a rare substance, found chiefly in Transylvania, but recently discovered in Hungary, in North America, and in the Altaï silver mines. It sometimes occurs native, but more commonly as a telluride of gold, lead, or silver. For the method of extracting it, we must refer to any of the larger works on chemistry, and especially to the *Lehrbuch* of Berzelius. It was discovered in 1782 by Müller von Reichenstein, but it was not till 1798 that its properties were accurately studied by Klaproth. The word tellurium is derived from the Latin *tellus*, the earth.

TEMBU (Abatembu, or Tambookie) is the name of an important tribe of Kaffirs, occupying the region east of the present boundary of the Cape Colony, where it forms the eastern limit of the district of Queenstown, formed by Sir Harry Smith in 1849—1850, a rather elevated plateau, from which flow the headwaters of the Kei, Bashee, Tsomo and other important rivers. They number about 90,000 souls, and are of a less warlike and predatory nature than the adjoining tribes of the Amaxosa and Amagaleka Kaffirs. In the earlier Kaffir wars and even in the great one of 1835—1836, the Tambookie Kaffirs remained neutral, and even friendly to the colonists; but in the war of 1848—1849 they were induced to join the other tribes, and were defeated with great loss by a small colonial force. In the war of 1851, they were much broken and scattered; but eventually submitting to the British authority, they have quietly located themselves in the unoccupied country east of the White Kei and Tsomo rivers, a good pastoral region, but rather bare of wood. Wesleyan missionaries have several stations amongst the Tambookie tribe, and many of them exhibit very pleasing features. A British resident, paid by the Cape Colony, also resides amongst them.

TEMESVA'R, the capital of the Temeser Banat (q. v.) or Servian Woiwodschaft, is a strongly fortified city on the Bega Canal, 358 miles south-east of Vienna, by the Vienna and Basiasch Railway. There is an inner fortified town, properly so called, and three suburbs. Though surrounded by marshes, T. has rather a pleasing aspect. It is the residence of the military governor, the seat of a Roman Catholic and a Greek-United bishop, is built with tolerable regularity, and contains many beautiful houses and many excellent educational and other institutions. Tanning and leather-making are considerable branches of industry, and the transit-trade, especially that with Turkey, is important. T. has endured a vast number of sieges—the latest being that of 1849, when it was bombarded for 107 days by the Hungarian insurgents, but was relieved at the end of that time by Marshal Haynau. Pop. (1880) 33,829.

TE'MPÉ, a narrow valley or gorge, about 4½ miles long, in the north-east of Thessaly, between Olympus (q. v.) and Ossa (q. v.), through which flows the river Peneus. The classic poets (none of

whom, curious to say, appear to have ever seen the glen) praise it for its matchless beauty, and hence the name became with them a synonym for any lovely vale. In point of fact, however, the scenery of T. is characterised by wild grandeur rather than by soft sylvan charms.

TE'MPERA, in Painting, the same as *Distemper* (q. v.).

TE'MPERAMENT is a term which has been employed in Physiology ever since the time of Galen, to designate certain physical and mental characteristics presented by different individuals. Dr Todd, in his article on this subject in the *Cyclopædia of Anatomy and Physiology*, observes that 'the temperaments the existence of which seems most consistent with observation, are those admitted by Cullen, namely, the *sanguineous* and the *melancholic*, the *phlegmatic* being a degree or modification of the sanguineous, and the *choleric* of the melancholic.'

Individuals of the *sanguineous* or *sanguine* temperament are such, according to Cullen, as have the quantity of fluids in the body large in proportion to the solids; the habit of body soft and plump; the skin smooth, white, and readily sweating on exercise; the hair soft, and generally pale, passing from thence to a red tint; the complexion ruddy; the eyes blue; the bodily strength moderate; and the mind sensible, irritable, cheerful, and unsteady. In persons of the *melancholic* temperament, the habit of the body is somewhat hard and meagre; the skin and complexion coarse, and of a dun colour; the hair hard, curly, and black; the strength considerable; the mind slow, disposed to gravity, caution, and timidity, but tenacious and steady.

Some writers recognise a *nervous* temperament, in which the predominating characteristic is a great excitability of the nervous system, and an undue predominance of the emotional impulses. This temperament is always associated with the sanguineous or the melancholic. In both sexes, the characteristics of the temperaments are far less manifest in old age than in earlier life. If it be admitted, as Dr Todd believes, that a constant connection exists between colour and temperament, it obviously follows that the nature of the temperament is determined by certain peculiarities in the physical condition of the organism. The different temperaments often merge so gradually into one another that it is in many cases difficult to decide positively to which variety any special case belongs.

TEMPERAMENT, in Music, a system of compromise in keyed instruments for the avoidance of the necessity presupposed by the strict relation of musical intervals of having a separate row of keys corresponding to each tonic. Taking C as keynote, the ratios of the notes of the diatonic scale, as derived from the number of vibrations in a given time of a string sounding that note (see MUSIC), are:

C	D	E	F	G	A	B	C
24	27	30	32	36	40	45	48

The intervals between these notes are by no means equal, and may be thus expressed in numbers by logarithms:

C–D	D–E	E–F	F–G	G–A	A–B	B–C
51	46	28	51	46	51	28

We have here three species of intervals, of which those represented by 51 are called major tones; those by 46, minor tones; and the smaller intervals represented by 28, semitones. These intervals will evidently only serve with C as keynote. If, for example, we start from D instead of C, we find E a tolerable, though not quite correct, second to D; but the third and seventh of the scale are entirely wrong. Were the major and minor tones equal, and each semitone exactly half a tone, the insertion of a note in the middle of each tone dividing the seven intervals would make it immaterial where the scale began; any one of the twelve notes becoming alike available as a keynote; and though such equality is contrary to the immutable principles of harmony, an arrangement based on it is found practically to give but little offence to the ear. In what is called the *equal temperament*, the twelve intervals are all of the same length, and no advantage is given to one key over the rest. This is, in theory at least, the temperament adopted in the pianoforte. Another system, known in this country as *Smith's* or the *vulgar temperament*, in which some keys were favoured at the expense of others, has been much used in organs. While the keys of B♭, F, C, G, D, and A are more perfect than on equally tempered instruments, E♭, A♭, D♭, and F♯ contain some very harsh intervals. The bad fifths and thirds which exist in these keys are designated by musicians by the name of *Wolf* intervals. This mode of tuning the organ is being more and more abandoned for the equal temperament, or an approximation to it. The different characters of the various keys often observed on the pianoforte, as well as the organ, could have no existence were the temperament absolutely equal, and arise out of the circumstance that this strict equality is not altogether adhered to in practice.

TE'MPERANCE. *History of the Movement.*—The origin of the temperance movement dates from the beginning of the present century; and the merit of having taken the first steps in the matter belongs to America, where the vice of drunkenness appears to have reached an alarming height about that time. In the month of April 1808, a society was established at Moreau, county of Saratoga, in the state of New York, consisting of 43 members; one of whose rules was as follows: 'Art. 4. No member shall drink rum, gin, whisky, wine, or any distilled spirits, or compositions of the same, or any of them, except by the advice of a physician, or in case of actual disease (*also excepting at public dinners*), under the penalty of 25 cents, provided that this article shall not infringe on any religious rite.' This society had other rules prohibiting members (under penalties) from offering any of the above liquors, or from being intoxicated; but though it continued to exist for 14 years, it does not seem to have accomplished much good. Gradually, however, the attention of the clergy and of philanthropical laymen was called to the subject; and after a series of sermons had been preached and published against a vice whose rapid progress was threatening (according to Dr B. J. Clarke) to make the Americans 'a community of drunkards,' a society was started at Boston (February 1826), called *The American Temperance Society*, 'to restrain and prevent the intemperate use of intoxicating liquors.' In 1829, *The New York State Temperance Society* was formed; and before the close of the year, 1000 local societies, with 100,000 members, were in existence, and a periodical, entitled *The Journal of Humanity*, established to promote the new movement. Rumours of the progress of temperance societies soon reached the Old World, and in August 1829, a society was started at New Ross, in the county of Wexford, Ireland, under the auspices of the Rev. George Whitmore Carr, the members of which pledged themselves 'to abstain from the use of distilled spirits, except as a medicine in the case of bodily ailment;' and further, 'neither to allow the use of them in their families, nor to provide them for the entertainment of friends.

Simultaneously, a movement in favour of temperance was begun in Belfast and the north of Ireland, by the Rev. Dr Edgar, Rev. Dr Cooke, and Rev. Mr Morgan, and before 12 months were over, 60 societies had been constituted, numbering about 3500 members, both Catholics and Protestants. Meanwhile, Scotland had not been uninfluenced. As early as October 1829, Mr John Dunlop of Greenock, a justice of peace for Renfrewshire, after lecturing on the subject of temperance in Glasgow, Stirling, and elsewhere, succeeded in forming a society at Greenock, the first in Scotland, and the precursor of *The Glasgow and West of Scotland Temperance Society*, formed in the ensuing November. Mr Dunlop is thus entitled to be considered 'the Father of temperance societies in Great Britain.' In his early labours, he was greatly assisted by Mr William Collins of Glasgow, who became the editor and publisher of the *Temperance Record* (1830—1835). The rules of *The Glasgow and West of Scotland Temperance Society* were substantially the same as those of the American and Irish societies—the members voluntarily agreeing 'to relinquish entirely the use of ardent spirits, except for medicinal purposes,' although 'the moderate use of other liquors is not excluded.' The zeal and activity of this society were remarkable. According to the Report read at the first annual meeting (December 30, 1830), it had circulated in the course of the year 125,300 tracts and 20,200 pamphlets, and numbered in Glasgow alone 5072 adherents; while it was stated that throughout Scotland at large there were 130 societies, and 25,478 members. It is not necessary to follow further in detail the course of the temperance movement, *strictly so called*, in Scotland, except to remark, that numbers of the clergy now began to interest themselves in it, and at the close of 1831, there were 187 ministers of various denominations in Scotland connected with the cause; but we must now notice the introduction of a new and more stringent application of the temperance principle. On the 21st September 1830, Mr John Davie, and several other members of the Temperance Society of Dunfermline, pledged themselves to 'total abstinence from all intoxicating liquors—small-beer excepted, and wine on sacramental occasions;' and in the course of the next two years, 'Total Abstinence Societies' were started in Glasgow, Paisley, and other places. In 1830, the temperance movement extended to England. Mr Henry Forbes, a merchant of Bradford in Yorkshire, happening to be in Glasgow on business, had attended one of the meetings of the Glasgow Society, became deeply interested, and on his return home took steps to organise a Bradford Society (February 2, 1830). Another society was formed at Warrington (April 4, 1830); a third at Manchester (May 12, 1830); and by the close of the year, about 30 temperance societies were in existence, numbering in all 10,000 members. In June 1831, *The British and Foreign Temperance Society* was organised in London, mainly through the persevering efforts of Mr William Collins of Glasgow. This was for many years the leading society of the party, its patron being the Bishop of London, and its vice-presidents including several other prelates, distinguished officials both civil and military, and a few members of parliament. The pledge taken by its members was simple: 'We agree to abstain from distilled spirits, except for medicinal purposes, and to discountenance the causes and practice of intemperance.' We have not space to narrate its history and progress in detail, but we may notice that it was instrumental in awakening an interest in the temperance movement both in the army and navy, and that, in the course of a single year (1831—1832), it could boast of having induced 400 old Greenwich pensioners to give up their grog!

Gradually, however, the more fervid friends of temperance in England, arrived at the same conclusion as the Dunfermline 'reformers'—viz., that a crusade against gin and other 'alcoholic' liquors was not enough; that 'beer' was the great cause of drunkenness in their country, and that nothing but total abstinence from all intoxicating drinks would cure the evil. The movement in this direction first took shape at Preston in Lancashire, in September 1832, when Mr Joseph Livesey, and some other members of the Temperance Society there, pledged themselves 'to abstain from all liquors of an intoxicating quality, whether ale, porter, wine, or ardent spirits, except as medicines.' An active propagandism in all the principal towns of Lancashire followed, and a considerable number of adherents were gained to the new cause. In September 1833, according to the commonly received story (see Burne's *Teetotaller's Companion*, p. 333), the notable word *Teetotal* was first used. A certain Richard Turner, or, as he was more generally called, 'Dicky Turner,' a plasterer's labourer or *lime-larry*, who was much given to holding forth in the Lancashire dialect at the meetings of the new sect, happened in the course of a philippic against temperance to say: 'I 'll hev nowt to do wi' this moderation—*botheration*—pledge; I 'll be reet down tee-tee-total for ever and ever.' 'Well done, Dicky!' said Mr Livesey: 'that shall be the name of our new pledge.' This origin of the word, which appears to make it but a stuttering pronunciation of *total*, has, however, been disputed; and it is affirmed that the term is simply a Lancashire phrase for final, thorough, or complete; thus, when a man is discharged merely for want of work, he is said to be *sacked*, but when discharged from inability to work, *teetotally sacked*. Whatever may have been the origin of the term, the new sect was resolved to be 'thorough.' In April 1834, a *Youths' Temperance Society*, on strictly teetotal principles, was formed at Preston, and before a year had passed, it reckoned nearly 1000 members. By dint of zeal, respectable teetotal societies were also established at Manchester (August 1834), Lancaster (November 1834), Colne (December 1834), Isle of Man (December 1835), and numerous other places. Meanwhile (September 1835), a conference of Lancashire and Yorkshire delegates was held at Manchester, and a new general society formed under the title of *The British Association for the Promotion of Temperance on the Principle of Total Abstinence from all Intoxicating Liquors*. This title clearly indicated the ambitious views of the new sect. It wished, and it hoped ere long, to speak in the name of the whole temperance party; and as early as 1836, one of the Yorkshire district societies, that of Wilsden, ventured to memorialise *The British and Foreign Temperance Society* of London on the subject of the total abstinence pledge. The answer that it received shewed that a disruption was not far off. In Scotland and Ireland, the progress of teetotalism, as distinct from temperance, was not at first very marked; but its votaries were resolute, and held vehement discussions, public and private, with the advocates of the rival system, in which they were generally considered victorious by the crowds before whom they disputed. During 1834—1835, teetotalism was struggling hard for recognition in London—the influential leaders of the old Temperance Society being dead against it. At length, however, owing to the persevering efforts of Mr Livesey of Preston and other enthusiasts, the teetotallers got a footing, and, in September 1835, established *The British Teetotal Temperance Society*, which, in August 1836, was merged into *The New British and Foreign Society*

for the Suppression of Intemperance. Teetotalism now in turn began to get the upper hand, and in the course of the next two or three years, the 'moderate' party almost disappeared; the majority of its members doubtless passing over to the ranks of the total abstainers. But these now fell out among themselves. Up to 1839, *The New British and Foreign Society* had two pledges, the long and the short; the former including the 'neither give nor offer' clause; and the latter omitting it. The more rigorous teetotallers made strenuous efforts to get the 'short' pledge abolished, which were as strenuously opposed, and in a very brief period the whole teetotal world was up in wild commotion on the subject. Various meetings of 'delegates' from the different societies in England, Scotland, and Ireland were held in London in May 1839, under the presidency of Earl Stanhope, and scenes of the utmost disorder ensued. The result was a temporary disruption, and the formation of two societies. Still the cause prospered in spite of fierce distractions. Strong provincial associations were formed in Yorkshire, Leicestershire, Lancashire, Norfolk, and Cornwall and Wales, almost always on the 'long pledge' principle. In Scotland, the 'long pledge' took deep root; indeed, after 1837—1838, the 'short pledge' was scarcely ever thought of. But it was in Ireland that the most brilliant successes attended the movement. In 1838, Father Mathew (q. v.) commenced his extraordinary career, and in less than two years, 1,800,000 men and women were enrolled in *Ireland's Great National Total Abstinence Society.*

The subsequent history of the movement must be briefly sketched. In November 1842, the disruption, above mentioned, of *The British and Foreign Temperance Society* was healed, and the two societies which that disruption had called into existence were amalgamated in *The National Temperance Society.* The work of proselytising then went on vigorously. Innumerable tracts were circulated, and all Britain echoed with the noise of infinite speech. Excursions, processions, Exeter Hall demonstrations, incessant tea-parties, &c. were got up with enthusiasm, which speaks volumes for the energy and sincerity of the teetotal agents. But in a less showy though more noble way, the missionaries of the new faith pursued their benevolent work in the lanes and alleys of large cities, the haunts of profligacy and dissipation, where they sought out the homes of drunkards, and tried (not without success) to rescue them from the power of the horrible vice that was dragging them to destruction. Many instances of this success could be cited—of men seemingly lost to society being reclaimed and raised to positions of honourable usefulness. It is, we are assured, a fact, that the majority of temperance hotels, now established in great numbers throughout the country, owe their existence and success to the enterprise of reclaimed men. Action of this sort—whatever one may think of the movement as a whole—is to be spoken of only with reverence. In August 1846, *The World's Temperance Convention* met in London, on which occasion, 302 delegates were present, representing different societies in the United Kingdom and the United States. Since then, the temperance cause has steadily, if not rapidly, progressed. Numerous local societies have been formed. There is scarcely a town or village in the country but has its fraternity of abstainers. Lecturers are constantly at work; pamphlets of various merit are every now and then making their appearance, advocating on social, religious, prudential, or physiological grounds the adoption of the new system; reviews and newspapers have been started for the same purpose; and at present it is estimated that there are not fewer than 3,000,000 total abstainers (inclusive of juveniles) in Great Britain and Ireland, and a much greater number in the United States of America. Of late years, total abstainers have devoted themselves mainly or largely to advocating the necessity or propriety of imperial legislation on the subject of intoxicating liquor (see below).

Pleas and Counter-pleas.—The question of abstinence from intoxicating liquors is capable of being argued on three distinct grounds, *scriptural, physiological,* and *social.* We propose to furnish a brief synopsis of the leading arguments *pro* and *con* under each of these aspects. First, then, the *Scriptural argument.*

The Scriptural argument in favour of abstinence from intoxicating liquor may be briefly stated. The only 'strong drink' mentioned in the Bible is wine It is both praised and blamed. The question raised by teetotallers is: Are the sacred writers referring in both cases to the same kind of wine? This they deny, and endeavour to make good their denial by an appeal to the original Hebrew. On examination, it is found that ten or twelve different designations for wine are used, but the two by far the most frequent are *yayin* and *tîrôsh.* The first of these is the generic term for wine, and therefore (say the advocates of total abstinence), as it *must* embrace fermented liquor, it is the word used when wine is denounced. Thus, it is *yayin* that is 'a mocker' (Prov. xx. 1), that is not to be looked upon (Prov. xxiii. 31, 32), &c. On the other hand, when wine is praised, *tîrôsh* is the word used, and *tîrôsh* (it is asserted) means the wine in clusters, that is, the actual grape itself, or the unfermented juice thereof, then, as now liberally drunk as a beverage by the inhabitants of Syria and elsewhere. The application of this view to the New Testament is obvious. If there was a wine that might be used, as well as a wine that was condemned—which, ask the teetotallers, would Christ and his apostles be most likely to sanction? The wine that 'maketh red the eyes,' that 'biteth like a serpent, and stingeth like an adder,' that 'deceiveth,' that 'maketh drunken' and 'mad,' or the wine that 'maketh glad the heart,' that is 'good,' a 'blessing,' &c.;—in a word, *yayin* in any of its dangerous forms (*sôbe,* from the root to 'soak;' *chemer,* the 'foaming or bubbling;' and *mesec, mezeg, mimsac,* the mixed wines), or the innocent *tîrôsh,* that cheers, but not inebriates? It is conceived that there can be but one answer to this question, and that every candid and reverent Christian must be forced to the conclusion, that the wine which Jesus made at the marriage-feast at Cana of Galilee, and used in his last supper with his disciples, and which Paul advised Timothy to drink for his stomach's sake, was the unfermented, innocuous, and popular *tîrôsh.*

To this it is replied that the distinction made between *yayin* and *tîrôsh* does not exist. Both parties are agreed that the former term is the generic one (corresponding with the Greek *oinos,* the Latin *vinum,* and the English *wine,* with all of which it is believed to be etymologically connected); but it is denied by the scriptural opponents of total abstinence that *yayin* means fermented, and *tîrôsh,* unfermented wines, exclusively. Not to trench upon the chemistry of the question, which, it is affirmed, wholly disproves the possibility of the 'juice of the grape' being kept for any length of time without undergoing a process of fermentation, and thereby acquiring to a certain degree intoxicating properties, it is alleged that the etymology of *tîrôsh* does not favour the teetotal view. According to Gesenius, it is derived from the root *yârash,* 'to get possession of;' that is, of the

brain. Dr Lees, indeed, quotes Bythner as suggesting that it may have been so named because the vine was a 'possession' in the eyes of the Hebrews; but this is extremely improbable, and in the absence of other explanations, that of Gesenius is certainly to be preferred. Again, *tîrôsh* is not exclusively used to denote the 'fruit' (strictly so called) of the vine; the dreaded *yayin* performs the same harmless function—e. g., in Jer. xl. 10, 12, where it is connected with a verb significant of 'gathering,' and in Ps. civ. 14, 15, with another expressive of growth. It is even denied that *tîrôsh* is ordinarily to be so understood, for although, being mostly found in connection with 'corn,' the verb applied to the consumption of that article of food is by *zeugma* made to apply to the 'wine' also, yet in the only passage where the act of consuming *tîrôsh* alone is mentioned (Is. lxii. 8, 9), the verb is *shâthâh*, which invariably signifies the act of drinking. Lastly, it cannot be shewn that *tîrôsh*, when it does mean wine, means innocuous wine. No doubt, *yayin* is the one generally employed when wine is denounced, and *tîrôsh* when it is praised, but this is not uniformly the case, for in Hos. iv. 11, 'whoredom and wine (*yayin*) and new wine (*tîrôsh*) take away the heart,' *tîrôsh* actually forms (as has been remarked) 'the climax' of intoxicating influences. The conclusion, therefore, to be drawn from a consideration of Scripture is, that the distinction insisted on by total abstainers between the two terms—viz., that the one (*yayin*) means fermented, and the other (*tîrôsh*) unfermented wines, is one that cannot be maintained. Both must be held as referring to fermented intoxicating wine; and the praise of *tîrôsh* is simply to be considered a recommendation of the moderate use of ordinary wine, as the condemnation of *yayin* is to be regarded as a solemn prohibition of excess in the same.

The physiological argument in favour of total abstinence necessarily takes various shapes; for it is concerned with physiological questions which are yet, to a great extent, matter of opinion—of speculation and conjecture, not of science. A question arises upon three distinct points: 1st, the effects of alcoholic liquors in quantities sufficient to produce intoxication; 2d, their effects when habitually used in moderate quantities; 3d, the effect of abstaining from them altogether.

Upon the first point, teetotallers usually maintain that insanity, idiocy, almost every form of organic disease, many chronic, not a few acute disorders, are frequent results of habitual intoxication; that the children of drunkards are often idiotic, and have transmitted to them various diseases, which are produced by excessive drinking—which, therefore, tends to the deterioration of the race; that drunkards are always the first victims of epidemics; and that it can be shewn from tables of mortality that drinking has a marked effect in shortening life. It is not disputed that many of these effects can be connected with the habitual use of liquors in excess; but as to some of the most striking of them, it is denied that they are physiological effects of such excess—being not direct results of hard drinking, but due to the bad conditions under which poor people who drink hard usually live. The question between teetotallers and those who differ from them, at this point, however, is only a matter of degree. The latter admit that alcohol, in narcotic or intoxicating quantities, produces only injurious results. In such quantities, it has a deteriorating, a devitalising influence upon the brain and nervous tissue, and habitual excess in its use is attended by a progressive impairment of nervous structure, indicated at length by such results as epilepsy or delirium. See INTOXICATION. But the results of excess differ greatly, it is said, in the case of different persons, so that, not unfrequently, many years of hard drinking do not affect the system of the drinker in a marked degree.

It is upon the second point—the habitual use of alcoholic drinks in moderation—that the opinion of teetotallers seriously conflicts with that of many physiologists. The teetotal argument—leaving out minor points, such as an alleged effect of alcohol in impairing the digestion—may be stated thus: 1. Alcohol can never have been intended by nature for the food of men. It is never produced spontaneously in nature. The vegetable world yields in abundance the principles which form the flesh, and those which keep up the heat of the body, but the healthy plant never produces alcohol. In the body, too, in health, food is never converted into alcohol. And the body does not merely not produce alcohol; it treats it as a foreign element, and gets rid of it as fast as possible. 2. Alcohol in the body, by taking up the oxygen supplied through the lungs, checks the burning of tissue, upon which life and the production of energy, muscular or mental, depend; and similarly it impedes the efforts of the body to get rid of the waste matters which are the products of the burning. It thus lowers vitality, vitiates the blood, and prevents the production of healthy fibre. Toddy or beer taken at bedtime, instead of being favourable to health, has just the same effect, according to Dr Carpenter, with sleeping in a four-post bed with the curtains carefully tucked under the bed-clothes. In either case, that is, there is a diminution of the supply of oxygen required for vital processes, especially for burning the waste of the body. 3. The stimulation produced by alcohol is succeeded by a recoil or reaction; and to produce a certain effect of stimulation, the quantity taken must constantly be increased. From this cause—to say nothing of social influences connected with drinking calculated to produce the same result—moderate drinking tends to pass into excessive drinking, about the evil consequences of which there is no dispute.

The physiological opinion opposed to those arguments is, that while alcohol, like other similar substances, has, in large quantities, a narcotic, a devitalising effect, it has in small quantities a stimulating effect, between which and narcotism there is a difference, not of degree, but of kind. The stimulating effect is precisely the same with that of highly-nutritious and easily digested food; as regards the vital functions, it differs from the effect of ordinary food only in rapidity of production. It does not substitute an abnormal for the normal action of the bodily organs; it restores their natural functions; and it is capable of rectifying either deficient or redundant functional action. The only positive difference of effect between ordinary food and alcoholic stimulation is, that the latter does not, to any great extent, add to the bulk of the body. There is no recoil or reaction after it, except that, as in the case of ordinary food, the effect is exhausted after a time. There is nothing to support the belief in a reaction, except the depression involved in the gradual recovery from the narcotic effect of a large quantity of alcohol; but between the narcotic effect of a large, and the stimulating effect of a small, quantity, there is, as already said, a difference of kind—their connection is merely accidental. And the experience of mankind—the fact that moderate drinking does not usually pass into excessive drinking—sufficiently shews that it is not found necessary to increase the quantity used for stimulation. Since stimulation restores the natural functions, it, of course, is capable of removing the consequences of functions being perverted. Thus, it is maintained that, among other things, it gives relief from pain

and muscular spasms, reduces the circulation when too rapid, produces healthy sleep, and removes general debility, as well as the fatigue of special organs. Whether it, to an important extent, affects the waste of tissue, or keeps waste matters in the blood, is at present undetermined; however this may be, there is no justification for holding that life is to be measured by the aggregation of tissue, or the rapidity of bodily changes. The notion that alcohol checks the burning of tissue by taking up the oxygen received by the lungs, originated when it was believed, upon the authority of Liebig (it was so believed until a few years ago, but the contrary is generally held now), that alcohol was altogether decomposed in the body. If these views are correct, it follows that alcohol, taken cautiously and in small quantities—the quantities varying with the circumstances and with the constitution of the individual—may be used not only with safety but with advantage.

Under the third head, teetotallers, of course, maintain that total abstinence is highly favourable to health. They adduce their personal experience; the mortality statistics of one or two regiments and of ships' crews mainly, or entirely, made up of abstainers; the evidence of arctic voyagers on the one hand, and of travellers in tropical regions on the other, to prove that in every climate health can be maintained, and is most likely to be maintained, when no use is made of alcoholic drinks. On the other side, the fact that men of all races use alcoholic beverages, is held to shew that men, living as men must usually do, find those beverages useful, if not necessary. It is not disputed that many persons live in health without them—that persons having an abundance of wholesome food, not overworked, living in well-constructed houses, and in wholesome air, can usually dispense with them. But when some, or all, of those conditions are wanting—which in towns, at anyrate, happens in all but exceptional cases—it is alleged that a nearer approach to health is made when a moderate use is made of alcohol.

The social arguments in favour of total abstinence, though very weighty and earnestly insisted upon, can be indicated in a few sentences. It is affirmed that the use of alcoholic drinks is at the root of all the misfortunes of the poorest and most numerous class; that it is the chief cause of pauperism, the chief cause of crime, a frequent occasion of immorality; that it lowers the health and shortens the life of the great mass of artisans and labourers, makes their homes wretched, and exposes them and their families to the evils and temptations of chronic destitution. Then, such are the seductive influences of drink and good-fellowship, that moderate drinkers are in danger of becoming drunkards; thus the use of liquors effects the ruin of a considerable percentage of the middle and upper classes. Total abstinence is demanded as a measure of personal precaution, because no one who drinks at all is safe against falling into drunkenness; as a patriotic duty, incumbent upon those who desire the improvement of the poorer classes; as a duty of example which every man owes to his neighbour, and which, involving self-denial, must have a favourable reflex influence upon character. On the other side, it is not denied that drinking is closely connected with, or that it exasperates, the misery undergone by the poor; but it is denied that it is the cause of the misery. It is maintained that drinking must be regarded as an effect of the bad conditions inherited by the poor, and under which they live. Persons born in close alleys, and brought up in foul air, living always from hand to mouth, often upon insufficient or unwholesome food, feel (it is said) a need of stimulants to support vitality; they drink to excess because they are poor, and thriftless, and reckless, and badly supplied with food, and air, and light. Drinking, then, confirms their poverty, and helps poverty to produce pauperism and crime. It is affirmed that the fluctuations of crime (properly so called) do not depend upon the amount of drinking, but—so far as they can be traced to one circumstance—upon variations in wages; that it is destitution, not drunkenness, that contributes most largely to the production of crime. The drunkenness, the crime, the pauperism, it is maintained, cannot be permanently reduced except through a material and moral improvement being effected among the poor. Then it is denied that moderate drinkers, in general, are in any danger of becoming drunkards; it is persons wanting in prudence, and of intemperate constitution, who are exposed to that danger. It is not disputed, that if a man cannot drink without drinking to excess, it is wise in him to abstain from beverages altogether. It is admitted, too, that if a man has within his family or household a person prone to excess in drinking, it may be his duty to exclude liquors from his house altogether. But it is maintained, that the duty which a man owes to his neighbours, in general, is to shew them an example of temperance, and that he does this if he avoids intemperance. The excesses of others no more impose upon a man the duty of total abstinence from beverages which contribute to his health and comfort, and to his social enjoyment, than the great frequency of imprudent marriages, or the existence of a great social evil in the irregular association of the sexes, imposes upon him the duty of celibacy.

Of late years, total abstainers—in unison with others who, though not themselves abstainers, are anxious to promote public sobriety—have exerted themselves to obtain, in one shape or another, a legislative prohibition of the trade in drink. This movement was set on foot in Great Britain in 1853, by an organisation called 'The United Kingdom Alliance,' on account of the success which had crowned the exertions of teetotallers in Maine and many other of the United States of America. In Maine, the liquor-traffic was suppressed in 1846; the law was made more stringent by a provision for confiscating all alcoholic drinks in 1851; and though, in 1856, the existing laws were repealed, and it became lawful to distil spirits, to sell spirits, and to have spirits in possession, drinking-houses continued to be prohibited. The 'Alliance' soon found that there was no possibility of carrying a Maine liquor-law through the British parliament; and they have accordingly confined themselves to asking for a Permissive Bill, enabling the ratepayers of a parish, if a majority of two-thirds of them should think fit, to suppress all public-houses within the parish. Hitherto, they have been unsuccessful. They support the bill upon the merits by a variety of arguments. Alcohol, they say, being a poison, its sale ought to be subject to the same restrictions as that of other poisons. The legislature has admitted the exceptional and dangerous nature of the liquor-trade, by putting it under strict regulation; in consistency, it should suppress it as a trade altogether. They allege that the amount of drinking in a place always varies directly with the number of public-houses; and then that the amount of crime and of pauperism varies directly with the amount of drinking. In 1857, Dr Lees calculated the expense of the use of liquors to this country at 120 millions a year—the cost of the liquor being put at 60 millions, and the remainder of the amount made up by allowing for the crime and pauperism caused by drinking, the loss of time in drinking, and, through disease induced by drinking, the waste

of life consequent upon it and many minor items. This money, it is said, if not spent upon drink, would have a marvellous effect in improving the condition of the poor. It is declared to be reasonable that the inhabitants of a parish should be left to say whether they would tolerate public-houses or not; also that a great majority of the working-classes desire the passing of the bill. On the other side, it is maintained, *in limine*, that the subject-matter of this bill is so very important, and so full of difficulty, that parliament should not delegate its functions in respect of it to the ratepayers; also, that to do so would be to plant, in every parish in the country, the seeds of perpetual strife. Upon the merits, it is said that a prohibitory law could not be carried out—at anyrate in large towns, where the worst evils connected with drinking are found; and that systematic attempts at evasion would be made, which would demoralise the people, and put them in chronic antagonism to the law. Besides the arguments already stated upon this side, it is urged that—excepting the case of poisonous substances—it is no part of the duty of a governing body to say to its people: You shall not spend your money upon this or that; that it is unreasonable, in a fiscal point of view, to speak of the national resources being wasted upon liquors, any more than upon tea or beef, or other substances which perish with the using; and that the power of procuring articles which are desired is what men work for—the great motive of industry. It is also maintained that compulsory abstinence from drink would not produce the same results as voluntary abstinence; that men would seek indemnifications, resorting, it might be, to other and more injurious narcotics than alcohol, and to vices which might be even more injurious than drinking. It is said that abstinence, to be valuable, must be a sign of a moral improvement; and that it is safest we should leave the poor to face the temptations of their situation, trying to fortify them against these temptations by education, by giving them just moral and religious views—at the same time, holding before them the spectacle of temperance and its results in the case of the more comfortable classes.

The following are the leading organisations in Great Britain, that, with various modifications of creed, carry on the temperance agitation. They can claim as directors and advocates men of acknowledged position and ability; and the aggregate sum of money spent annually is very great. The National Temperance League, London (organ, the *Weekly Record*); the United Kingdom Alliance, Manchester, with numerous branches (organ, the *Alliance News*); the Church of England and Ireland Temperance Society, London (organ, the *Church of England Temperance Magazine*); the Scottish Temperance League, Glasgow (organ, the *League Journal*); the National Band of Hope Union, London (organ, *Band of Hope Review*).

TEMPERATURE OF THE BODY IN HEALTH AND DISEASE. It is universally admitted, as a result of the observations of numerous physiologists, amongst whom our own countryman, Dr John Davy, stands pre-eminent, that although the range of temperature varies in different parts of the human body, the normal temperature at completely sheltered parts of the surface amounts to 98°·4, or a few tenths more or less in temperate climates; and that if there is a persistent elevation above 99°·5, or a depression below 97°·3, some form of disease is certainly indicated. (In warm-blooded animals, generally, the temperature is one degree lower at completely sheltered parts of the surface than in the back of the mouth, or other accessible internal parts.)

Some of the circumstances which cause a deviation from the normal temperature are mentioned in the article on ANIMAL HEAT. It may be further noticed, that exposure to cold without exercise, and sustained mental exertion, reduce the temperature, and that the amount of heat is at first reduced after a full meal, although, as stated in the above-named article, it subsequently rises. Moreover, in the tropics, the average temperature is nearly 1° higher than in temperate regions.

When the temperature rises in cases of disease, the following relation to its augmentation and that of the pulse has been established: *an increase of temperature of* 1° *above* 98° *corresponds with an increase of ten beats of the pulse in the minute.* Thus, if the pulse is 60 at 98°, it is 70 at 99°, 80 at 100°, and so on. It is now established beyond all doubt, by the observations of Wunderlich, Virchow, and many other foreign physicians, and by Parkes, Jenner, Aitken, and Ringer in this country, that the preternatural heat which in certain cases can be detected by the thermometer, and may exist to the extent of 4°, 6°, or even 8° above the healthy average, and which varies in amount in different diseases, in different persons, and at different times of the same day, is the essential symptom of fever. Dr Davy, in his *Physiological and Anatomical Researches*, vol. i. p. 206, describes the case of a lunatic soldier, in whom the accidental discovery that his temperature was 6° above the normal standard, led to the detection of tubercular disease of the lungs and intestines. Wunderlich, whose experience embraces at least half-a-million exact thermometric observations, bears unqualified testimony to the value of this mode of investigation in the early detection of disease, and as often furnishing an important guide to treatment. Some of these instances are quoted by Dr Aitken in his *Science and Practice of Medicine*, 3d ed. vol. i. pp. 44—46.

We give in a condensed form a few of the more important of these observations. In *ague*, the temperature of the body begins to rise several hours before the beginning of the paroxysm; and after the disease *seems* to have disappeared, a periodic increase of the temperature may still be detected, and as long as this continues, the patient is not really cured. In *typhoid fever*, the rise of temperature, or its abnormal fall, will indicate what is about to happen three or even four days before any change in the pulse or other sign of mischief has been observed. A sudden fall of temperature has thus denoted intestinal hæmorrhage several days before it appeared in the stools. A fall as low as 93° was noticed by Parkes in a case of this kind. When a person, who yesterday was healthy, exhibits this morning a temperature above 104°, it is almost certain that an attack of ephemeral fever or ague is coming on; and should the temperature rise up to or beyond 106°·3, the case will certainly turn out one of ague or of some other form of malarious fever. If, during the first day of illness, the temperature rises to 106°, it is certain that the patient does not suffer from typhus or typhoid fever; and if the temperature of a patient, who exhibits the general signs of pneumonia, never reaches 101°·7, it is certain that there is no soft infiltration in the lungs. 'In typhoid fever, a temperature which does not exceed on any evening 103°·5, indicates a probably mild course of fever. A temperature of 105° in the evening, or 104° in the morning, shews that the attack is a severe one, and forebodes danger during the third week. On the other hand, a temperature of 101°·7, and below, in the morning, indicates a very mild attack, or the commencement of convalescence. In pneumonia, a temperature of 104° and upwards indicates a severe attack. In

acute rheumatism, a temperature of 104° is always an alarming symptom. In a case of jaundice otherwise mild, an increase of temperature indicates a pernicious turn. In tuberculosis, an increase of temperature shews that the disease is advancing, and that untoward complications are setting in. In short, a fever temperature of 104° to 105° in any disease indicates that its progress is not checked, and that complications may still occur.'—*Op. cit.*, p. 21. We may further observe that, from the observations of Dr Sidney Ringer, a persistent elevation of temperature exists as an invariable precursor of the growth of tubercle in any organ. As a general rule, when the temperature rises continuously to 106°·2, the prognosis is unfavourable; and when it rises to 110°, a fatal issue is almost certain. The diseases in which the highest temperatures have been observed are scarlatina, in which it has been noted at 112°, and tetanus, in which, at the period of death, it was 112°·5, and an hour afterwards was 113°·8. In Dr Aitken's work, the reader will find a series of diagrams illustrating the range of temperature in ague, erysipelas, measles, pneumonia, simple continued fever, scarlatina, small-pox, typhoid and typhus fevers, &c.; together with a full description of the instruments to be used, the method of using them, and practical rules for recording observations.

TEMPERING METALS. A peculiar effect is produced upon some metals by heating them to redness, and then suddenly cooling them. By this means, extreme hardness is obtained, especially in steel, which is so susceptible to this process, called tempering, that almost any degree of hardness and brittleness can be obtained. If, for instance, we make a piece of steel red hot, and then plunge it into cold water, it becomes hard and brittle when cold, and is actually, though slightly, increased in bulk. But if we reheat the metal, and allow it to cool slowly, it again becomes soft and malleable as before. Moreover, if we again reheat it, but not to redness, and cool it suddenly, it is still further softened. If, before reheating, the surface has been polished, a beautiful shade of colour is produced by the heat, which is varied according to the temperature employed; and so exactly is this the case, that the experienced manipulator is entirely guided by the colour produced, instead of by nice regulations of the heat applied. For ordinary operations, the metal is cooled by plunging it in cold water; but oil, mercury, and saline solutions are used for special purposes. An exact series of experiments has proved that the following colours are produced at the temperatures given: Very pale yellowish, by 430° Fahr.; pale straw, 450°; yellow, 470°; brown, 490°; mottled brown, 510°; purple, 530°; bright blue, 550°; blue, 560°; dark blue, 600°.

TE'MPLARS, KNIGHTS, a celebrated religious and military order, founded at Jerusalem in the beginning of the 12th c., by Hugues de Paganes, Geoffroy de St Omer, and seven other French knights, for the protection of the Holy Sepulchre, and of pilgrims resorting thither. Baldwin II., king of Jerusalem, bestowed on this order their first place of residence; and an additional building was acquired from the abbot and canons of the church and convent of the Temple, whence the order obtained the name of the 'Poor Soldiers of the Temple of Solomon,' afterwards abbreviated into Templars. The knights were bound by their rule to hear the holy office every day, or if prevented by their military duties, to say a certain number of paternosters instead; they were to abstain from flesh four days in the week, and from eggs and milk on Fridays. They might have three horses and an esquire each, but were forbidden to hunt or fowl. In the earlier period of their history, the Templars made a great show of poverty, contrasting much with their later condition. After the conquest of Jerusalem by the Saracens, they spread over Europe; their valour became everywhere celebrated; immense donations in money and land were showered on them; and members of the most distinguished families thought themselves honoured by enrolment in the order. In every country where they existed, they had their governor, called the Master of the Temple or of the Militia of the Temple. The Templars had settlements in England from an early period. The first was in London, on the site of Southampton Buildings, Holborn; but from 1185, their principal seat was in Fleet Street, still known as the Temple. The round church which bears their name was dedicated by Heraclius, Patriarch of the Church of the Resurrection in Jerusalem, in 1185, and the chancel was consecrated in 1240.

The Templars were at first all laymen and of noble birth. Pope Alexander III., however, in 1162, authorised the admission of spiritual persons not bound by previous vows, as chaplains to the order, who were not required to adopt the military vows. A third class was afterwards introduced, consisting of laymen not of noble birth, who entered as serving brothers, some of them being attendants on the knights, and others exercising trades in the houses or lands of the order. Eventually, many persons became affiliated members without taking the vows, for the sake of the protection afforded them. As the power and prosperity of the Templars increased, so did their luxury, arrogance, and other vices, which gave the French kings a pretext for endeavouring to suppress them, and lay hold of their possessions. Accusations, many of which were absurd and incredible, were brought against them by two members of their own body. Their principal enemy was Philippe IV. of France, who induced Pope Clement V. to accede to a scheme by which the whole members of the order were seized and imprisoned, their lands confiscated, and many of them tried, convicted, and executed for capital crimes. The English Templars were arrested by command of Edward II.; and a council held in London in 1309 having convicted them of various crimes, most of which were probably imaginary, the king seized their possessions. In 1312, the whole order throughout Europe was suppressed by the Council of Vienne, and its property bestowed on the Knights of St John, to which latter order their English possessions were formally transferred by a statute of Edward II. in 1323.

The habit of the Templars was white, with a red cross of eight points of the Maltese form worn on the left shoulder. Their war-cry was 'Beau séant;' and their banner, which bore the same name, was parted per fess sable and argent. They also displayed above their lances a white banner charged with the cross of the order. Their badges were the *Agnus Dei*, and a representation of two knights mounted on one horse—indicative of the original poverty of the order.—See Addison's *History of the Knights Templars, the Temple Church, and the Temple* (Lond. 1842); A. O. Haye's *Persecution of the Knights Templars* (Edin. 1865).

TE'MPLATE, a mould in wood or metal, shewing the outline or profile of mouldings, and from which the workmen execute the moulding.

TEMPLE (so called because the Knights Templars had one of their branches in that part of London) in its connection with the law of England, is a part of the city of London occupied exclusively by barristers or attorneys, with few exceptions. It is the joint-property of the two Inns

of Court (q. v.), called the Societies of the Inner Temple and Middle Temple, each of which has a right of calling persons to the degree of barrister—a privilege shared by the two other Inns of Court, Gray's Inn (q. v.) and Lincoln's Inn (q. v.). The Temple consists of buildings occupied by barristers, who rent the same from the above two societies, who are the private proprietors, and issue their own regulations as to the management of the property.

TEMPLE, Sir William, an eminent diplomatist and popular writer, was the eldest son of Sir John Temple, Master of the Rolls in Ireland. He was born in London in 1628, studied for two years at Emmanuel College, Cambridge (where he had the celebrated Dr Ralph Cudworth for tutor), and at the age of 19, went abroad on his travels. He acquired the French and Spanish languages, and also cultivated his taste for English composition. He entered on public life in 1661, as member for the county of Carlow, in the Irish parliament. In 1665, he was selected to proceed to Westphalia, on a secret mission to the Bishop of Münster; and on his return, he was created a baronet, and appointed resident at the court of Brussels. He was, as Sir James Mackintosh has remarked, the model of a negotiator, 'uniting politeness and address to honesty;' while, as a domestic politician, 'in an age of extremes, he was attached to liberty, and yet averse from endangering the public peace.' In fact, the chief aim and desire of this accomplished statesman was to enjoy lettered ease and leisure, apart from all exciting public care and responsibility. His most important diplomatic success was the famous treaty of 1668, known as the Triple Alliance, by which England, Holland, and Sweden bound themselves to unite in curbing the ambition of France. This negotiation was accomplished in five days, in conjunction with the great Dutch statesman, De Witt. At the congress of Aix-la-Chapelle, and at the subsequent treaty of Nimeguen, T. was also a negotiator. He was long ambassador at the Hague, and assisted in bringing about the marriage of the Prince of Orange with the Princess Mary. Charles II. in vain endeavoured to prevail upon him to accept the appointment of Secretary of State; but though shunning such arduous duty, he attempted to reform the government, by establishing, with consent of the king, a privy council of thirty persons, by whose deliberations his majesty promised to be guided in all public affairs. As might have been foreseen, so numerous a council, under such a sovereign as Charles, and in times of such fierce rivalry and faction, proved an utter failure. T. then finally abandoned politics, and retired to the country. When the Revolution placed William III. on the throne, T. was again solicited to become Secretary of State; but he again refused. The remaining ten years of his life were mostly spent at his favourite seat of Moor Park, in Surrey, where he carried out his schemes of planting and landscape gardening, and realised his early wish for studious retirement. During this period, he had, as secretary and humble companion, the immortal Jonathan Swift, who regarded his stately self-complacent patron with more fear and distrust than affection, but who ultimately became his literary executor. T. died at Moor Park, in January 1699. His collected works form four volumes (Lond. 1814).

As an author, T. is now known chiefly by his historical *Memoirs* and his *Miscellanea*, the latter being a collection of essays on various subjects—as government, trade, ancient and modern learning, gardening, heroic virtue, and poetry. He has been considered one of the reformers of our style; 'the first writer,' says Johnson, 'who gave cadence to English prose.' His style has quite a modern air, and is smooth, copious, and agreeable. He is too pretentious as respects scholarship and learning, and has no weight as a political writer; but he expatiates very pleasantly on foreign travel and country life, on flowers and fruits, on parterres, terrace-walks, and fountains. His epicurean temperament is happily and characteristically displayed in the last words of his last essay. 'When all is done,' he says, 'human life is at the greatest and best but like a froward child, that must be played with and humoured a little to keep it quiet till it falls asleep, and then the care is over.' This is taking the battle of life very easily, but it is not in such manner that great men or true patriots are formed.

TEMPLEMO'RE, a market-town of the county of Tipperary, province of Munster, Ireland, is supposed to take its name from a commandery of the Knights Templars, and is situated on the right bank of the river Suir, 9 miles north of Thurles. Although without manufactures of any note, T. has some considerable share of inland traffic. It is a station on the Great Southern and Western Railway, 79 miles distant from Dublin. The public buildings, one of which is an extensive barrack, are substantial, but without any noteworthy architectural character. The pop. is about 2500, of whom almost all are Roman Catholics.

TE'MPO (Ital. time), the degree of rapidity with which a piece of music is to be executed. The rhythmical proportions of notes, as indicated by their form, give them only a relative value, and have no reference to the absolute speed with which the composition should be played. Some compositions require, from their character, a quick lively movement; for others, a slower movement is more suitable; and different terms are used to indicate different gradations of movement. Of these, the principal, beginning with the slowest, are: *Largo*, broad; *larghetto*, somewhat broad; *lento*, dragging; *grave*, heavy, solemn; *adagio*, slow; *andantino*, moving a little; *andante*, moving; *allegretto*, somewhat lively; *moderato*, moderately quick; *allegro*, lively; *vivace*, with vivacity; *presto*, rapidly; *prestissimo*, with great rapidity. These terms are not always used with the precision that might be wished, and sometimes apply more to the character than to the absolute speed of performance. They are often modified by other qualifying words, as *allegro con brio*, lively and with briskness; *allegro appassionato*, passionately excited. The *tempo* is indicated with more exactness by a reference to the beat of the Metronome (q. v.). Thus, M.M.♩ = 120, signifies that 120 beats of the metronome, each representing a crotchet, are to fill up the space of a minute; M.M.♪ = 60, that 60 quavers are to be performed in a minute.

While the general rule is, that the time of a movement is to be steady and unvarying, cases often occur where a certain part of a composition has to be taken quicker or slower than the rest; this is indicated by such terms as *più vivo*, more lively; or *ritenuto*, kept back; while a return to the original time is expressed by the words *a tempo*. The performer may be required to proceed from one degree of movement to another, not abruptly, but gradually; the terms used to express this are: *rilasciando*, slackening; *ritardando*, retarding; *calando*, calming down; *stringendo* pressing on; *accelerando*, gradually increasing speed; with some others.

Tempo Rubato (stolen time) is the name given to a mode of performance in which a restless character is imparted by protracting one note beyond its proper duration, and curtailing another, so that the

aggregate duration of each measure remains unchanged.

TEMPORAL POWER (OF THE POPE) is a phrase susceptible of two meanings, which are very distinct from each other, and the confusion of which has led to frequent and serious misunderstanding.

I. In one of these senses, it means the sovereign power which the pope possessed as ruler of the so-called PAPAL STATES (q. v.), and which was abolished in 1870 by their annexation to the kingdom of Italy. The power which the pope exercised within these states, although modified in its exercise by his spiritual character, was in substance the same as that of any arbitrary sovereign. The history of its origin and progress, and of the variation of the limits within which it has been acknowledged, is briefly detailed under the head PAPAL STATES. The question as to the necessity or utility of such a power vested in the hands of a spiritual ruler, and even of its lawfulness and its compatibility with his spiritual duties, has been very warmly debated. The controversy is not of entirely recent origin. Many of the medieval sectaries put forward the principle of the incompatibility of the spiritual with the temporal power in the same person, not only in relation to the pope, but also as to the baron-bishops or other ecclesiastical seigneurs of that age. Such were the doctrines of the Vaudois, of Pierre de Bruis, and above all, of Arnold of Brescia. The last-named of these rendered himself specially obnoxious by the activity and even turbulence with which he propagated this view, and the sentence of death under which he suffered was the penalty of rebellion quite as much as of heresy. Through the centuries which followed, the anti-papal controversies turned so entirely upon doctrine, that there was little room for the discussion of this question, and it is a mistake to suppose, as has not unfrequently been done, that it entered in any way into the conflict of Gallican and Ultramontane principles. Even the great Gallican champion, Bossuet, not only admitted the lawfulness of the pope's temporal sovereignty, but contended that it was in some sense necessary to the free exercise of his spiritual power, and to the independence of his ecclesiastical government. It was not until the aggression of the French Republic upon Rome, and the subsequent annexation to the Cisalpine Republic, and afterwards to the kingdom of Italy, by Bonaparte, of the three Legations, that the controversy assumed any practical interest. During the later conflict between Pius VII. and the Emperor Napoleon I., the design which the latter entertained of a still further annexation was one of the main causes of dispute; and still more recently, upon the re-annexation of nearly the same portions of the papal territory to the kingdom of Italy, the question violently agitated the entire Catholic world. No formal and authoritative judgment of the Roman Church has been pronounced regarding it; but a strong and almost unanimous expression of opinion was tendered to the present pope, Pius IX., in the form of letters and addresses from bishops and others in every part of Catholic Christendom. The tenor of all these was nearly the same. They professed that the possession of temporal sovereignty is no essential part of the privileges of the successor of St Peter; but they also regarded the possession of a sovereignty independent of any particular sovereign, as the means providentially established for the protection of the spiritual independence of the pope, and of the free exercise of his functions as spiritual ruler of the church. The expression of a contrary opinion by some distinguished members of the Roman Church, although it was understood to be regarded with great disfavour and suspicion, was not formally condemned by a doctrinal decision; but as the actual aggression upon the rights of the Roman see was deemed a violation of the laws of the church, those who were active participators in the aggression were held to have incurred the ecclesiastical censures attached to such violation of the laws.

II. By the second signification of the phrase 'Temporal Power of the Pope' is understood what would more properly be called the claim of the pope, in virtue of his office, to a power over the temporalities of other kings and states.

This power may be of two kinds, *directive* an *coercive*. In the first sense, it is a claim which nc Catholic, consistently with his belief of the spiritual supremacy of the pontiff, can be supposed to deny, as it imports nothing more than that the pope, as supreme moral teacher, has power to instruct all members of his church, whether subjects or sovereigns, in the moral duties of their several states.

If the power be regarded as coercive, it is necessary carefully to distinguish the nature of the coercion employed. That coercion may be exercised either by the threat or infliction of *purely spiritual censures;* or it may involve temporal consequences, such as suspension or deprivation of office, forfeiture of the allegiance of subjects, and even liability to the punishment of death. Considered in the former sense, the claim must be regarded as a natural consequence of the spiritual headship of the church, which is acknowledged by all Catholics; nor can it be denied that the power to compel sovereigns, by purely spiritual censure, to the fulfilment of the moral duties which their state imposes, is a natural concomitant of the spiritual primacy.

But the claim of the popes to authority over the temporalities has gone far beyond these limits. From the 10th c. downwards, they have claimed and have repeatedly exercised a power of coercing, and when refractory, of punishing kings by suspension, by deprivation, and by the transfer of the allegiance of their subjects to another sovereign. This well-known claim has been a subject of controversy in the Roman Catholic Church between the Gallican (q. v.) and Ultramontane (q. v.) schools; and in the Ultramontane school, two different theories have been devised for its explanation. The first and most extreme (which holds the power to be a direct one) supposes that this power was given directly by God to St Peter and his successors, that the two powers are foreshewn by the 'two swords' mentioned in Luke xxii. 38, and that the temporal power is a privilege of the primacy by divine law, equally with the spiritual sovereignty itself. According to the second, or *indirect* theory, the temporal power is not directly of divine institution, but is an indirect though necessary consequence of the spiritual supremacy; and is only given as a means of completing, and, in a corrupt and disorganised state, rendering more efficacious the work which the spiritual supremacy is directly instituted to accomplish. It was in this latter form that the theory of the temporal power was defended by the great champion of Ultramontanism, Cardinal Bellarmine, and the celebrated declaration of the Gallican clergy in 1682 (see GALLICAN CHURCH) was directed against it.

A third view of the temporal power, and one which has found many modern defenders, was propounded by the celebrated Fenelon (q. v.). According to the theory of Fenelon, which is generally described as the historical theory, the pope does not possess, whether by direct divine appointment, or in virtue of the necessities of his spiritual office, any temporal power whatsoever. But he possesses the plenitude of that spiritual power which is required

for the government of the church, and he is empowered to enforce it by spiritual penalties, and especially by excommunication or deprivation of membership of the church. Now, although excommunication and such other penalties, of their own nature, are purely spiritual, yet the religious sentiment of the medieval period, and the profound awe with which it regarded the authority of the church, invested these penalties with certain temporal effects, the chief of which were the forfeiture of civil rights, and the loss of the most important privileges of citizenship, of which well-known examples survived, even in the post-Reformation legislation of England and other Protestant kingdoms. See EXCOMMUNICATION. The penalty of forfeiture of certain civil rights, which, in the case of private persons, the law of England attached to the spiritual censure of excommunication, was applied by the laws of other countries to the sovereigns themselves; by the law of Spain in the sixth council of Toledo in 638; that of France, as confessed by Charles the Bald in 859; the law of England, under Edward the Confessor, and the so-called Saxon and Swabian codes of Germany. The last-named codes recognise in the pope, in certain specified cases, the right to excommunicate the Emperor himself; and ordain that in case the Emperor should remain for twelve months without being absolved from the excommunication, he shall be deposed. In the appeal of the Saxon nobles to the pope against Henry IV., this law is expressly referred to. The contemporary historians, Paul of Bernried, Lambert of Aschaffenburg, Nicholas Roselli, and others, describe it as the ground of the Emperor's deposition; and even Henry himself, without denying the force of the law, sought his defence solely in a denial of the charge of heresy which was imputed to him. The same spirit of the age is exhibited in the form of oath taken at the coronation of the sovereign in many countries, especially (although not exclusively) in those whose kings—as Roger of Sicily, Peter III. of Aragon, Guiscard of Naples, Godfrey of Jerusalem, and John of England—had made their kingdoms feudatory to the see of Rome; by which the monarch swore to be the protector and defender of the sovereign pontiff and the Holy Roman Church in all their necessities and utilities, and to guard and maintain their possessions, honours, and rights.

From these and similar indications of the public feeling of the medieval time, the advocates of this theory of the Temporal Power infer that orthodoxy and obedience to the pope, in all essential matters of faith and discipline, were by the consent, express or tacit, of sovereigns and of peoples accepted as a condition of the tenure of supreme civil authority —a condition similar in its character and objects to that which forms the basis of the limitation settlement of the succession to the English crown, to the heirs of the Princess Sophia of Hanover, 'being Protestant.' Hence they conclude that the function really exercised by the popes in relation to heterodox or scandalously immoral sovereigns, or oppressors of the church and church liberties, was in itself a spiritual one, and that the civil consequences which it entailed of deprivation or deposition arose, not from the church law, but from the expressed or understood international civil law of the age. This view, it should be said, is not confined to Catholic writers, but is held by Leibnitz, Pfeffel, Eichhorn, Voigt, Frederick Hurter (while still a Protestant), and others.

On the other hand, it is difficult, if not impossible, to reconcile this theory with the language used by the popes themselves in enforcing their claim to temporal authority, and with the arguments upon which they rest that claim. Nor can it be denied that, whatever is said of the cases of the exercise of such a power which occurred in the 12th and 13th centuries, the power continued to be claimed and to be exercised down to and even after the Reformation, when it would be idle to suppose that any such public understanding, if it had existed in the middle ages, had not been revoked, if not by all, at least by those nations which had revolted from the Roman Church.

The history of most of the principal instances of the exercise of this power by the popes will be found detailed under the separate articles which refer to the particular popes or sovereigns who engaged in the contest of church and state.—See Gosselin's *Pouvoir du Pape au Moyen-Age.*

TENA'CITY (Lat. *tenacitas*, power of holding) is that property of material bodies by which their parts resist a force employed to attempt to separate them. It is the result of the attractive forces exerted by the particles of matter upon one another through the infinitesimally small spaces which are supposed to exist between them; hence it differs in different materials, and even in the same material at different degrees of temperature. The practical bearings of the tenacity of solids (especially of wood and iron) are discussed in the article STRENGTH OF MATERIALS; and we shall therefore here only state a few of the conclusions at which Muschenbroek and other experimentalists have arrived regarding the modifications which the tenacity of metals undergoes in consequence of various processes. Forging and wire-drawing increase the tenacity of metals in the longitudinal direction. Copper and iron have this property more than doubled, while gold and silver have it more than trebled by these metals being drawn into wire. Mixed metals have usually a greater tenacity than simple ones. See ALLOY.

TENAILLE, in Fortification (q. v.), a work in low relief, constructed immediately in front of the curtain. It may either have two faces, in a line with the faces of the adjoining bastions, and meeting at the centre in a re-entering angle; or three faces, of which two are prolongations of the bastion faces, and one parallel to the curtain. The tenaille must be low enough for the defenders to be safe from the musketry-fire on one bastion defending a breach in the other bastion. This work is of great use in protecting the ditch, covering the postern from the enemy's view, &c.

TE'NANCY AT WILL, in point of Law, means an occupation by a person in the character of a tenant, but for no fixed term other than the will or caprice of the landlord or proprietor. Rent is payable, under a tenancy at will, according to the time of occupation, and the tenancy can be determined by either party at any time. As soon as a tenant at will once pays rent he becomes a tenant from year to year. His tenancy cannot then be determined at the end of the current year, unless a reasonable notice to quit is served by the party intending to dissolve the tenancy of the other. But the tenant is not to be prejudiced by the sudden determination of the tenancy, so that if he has sown the lands, he is entitled afterwards to re-enter the lands, to reap the crops.

TENANCY IN COMMON, in point of Law, means a right to hold or occupy lands, or possess chattels, along with another or other persons. In such a case, each has an equal interest; but in the event of the death of either, his share does not go to the survivors, as is the case in Joint Tenancy (q. v.), but to his heirs or executors. Tenancy in common applies to ownership as well as household interests. Though each tenant has as much right to the whole property as the others, yet neither has a

definite share set apart to himself exclusively. If one wastes or deals with the property to a greater extent than his share, the others can bring an action against him. Each can at any time compel a severance of the property, so that thereafter he may have his own share severally.

TENANCY ON SUFFERANCE differs from a tenancy at will in this, that a tenant at will enters on a good title, whereas a tenant on sufferance has no title, and wrongfully continues. Thus, when the term has ended, and the tenant has got notice to quit, but does not, he continues a tenant on sufferance, and may be ejected at any time, unless the landlord elect to treat him as a tenant in continuation of the former lease.

TENANT FOR LIFE, in English Law, means one who has not the absolute property, but an interest in the property, which ceases with his own life, or the life of another. An estate for life in lands is classed with freehold estates. Where the estate for life depends on the life of a third person, as it is the interest of the tenant that such third person should live as long as possible, frauds are often committed on the reversioner by misrepresenting the fact of such person being alive; hence, to prevent fraud, the reversioner may insist on the third person being produced, failing which he will be taken to be dead. An estate for life is usually created by deed, but there are two legal estates for life—namely, the widow's estate in dower, and the husband's estate by courtesy on his wife's death. As a general rule, a tenant for life of real estate is entitled to take wood to repair and burn in the mansion of the estate; but he cannot for other purposes fell the trees, nor open mines or pits, though, if these have been already opened, he may carry them on. Sometimes a tenant for life is declared by the deed or will to be tenant without impeachment of waste, in which case he can exercise most of the rights of an absolute owner, except cutting down ornamental timber, or defacing the family mansion. Tenants for life may now apply to the Court of Chancery for leave to raise money to drain the lands and make improvements. When a tenant for life dies between the usual terms for drawing rent, the rent is apportioned between his executors and the party next entitled. A tenant for life is called, in the law of Scotland, a Liferenter (q. v.).

TENANT IN FEE SIMPLE, in English Law, is the old feudal description of one who is absolute owner, the fiction being that all were originally tenants of the crown. A tenant in fee simple has a freehold estate of inheritance, which is the highest degree of property known to the law. There is practically no feudal connection with the crown, and he can alienate or devise the property without the leave or sanction of the crown. A tenant in fee simple has an absolute right to the soil and the mines down to the centre of the earth, and has a right to build as high as he pleases. If he dies, the estate goes to his heirs—i. e., his heirs general; but he has power to devise it to whom he pleases, subject to certain restrictions, in cases where the donee is a charitable corporation or trustee for charitable purposes. See MORTMAIN. A tenant in fee simple is called, in the law of Scotland, a Fiar (q. v.).

TENANT IN TAIL. See TAIL, ESTATE.

TENANT-RIGHT. This term is used by the Irish tenantry to denote various claims of right which they maintain against their landlords, such as the right of occupancy not subject to removal; and the right to occupy at a rent not subject to increase on the ground of improvements; it being, they say, inequitable to make them pay rent for what they have themselves produced. The chief claim of right is with respect to the improvements. In Ulster, and in the north of Ireland generally, the equity of this branch of the claim is recognised and acted upon; and the landlord, when the tenant removes, either buys the improvements, or they are bought by the incoming tenant. This recognition of tenant-right in the north of Ireland is traceable to the footing on which the newly settled proprietors in the time of Cromwell arranged with the agriculturists whom they induced to come to them from Scotland. In the south of Ireland, on the other hand, this claim of right has never been conceded by the proprietors; while the right of occupancy not subject to removal has, *de facto*, been enjoyed by the tenants, who, however, are clamouring to have it recognised by law. The non-settlement of the question has long been the cause of bitter controversy, and undoubtedly its existing condition is the root of much of the national misery. Owing to the old tenure of land as tribal or clan property, the people of the south of Ireland have never taken into their minds the notion of 'contracting' with any one as the 'owner' of land. They have the traditional feeling of being themselves the owners; and so much has this feeling been a source of agrarian disturbances, that few Irish 'landed proprietors' have ever ventured fully to exercise their rights of property. And nothing is more common in the south than to find that the land has been in the occupancy of the same families from time immemorial, without lease or contract of any kind. The Irish claim of tenant-right very much resembles that made by the Indian ryots against their zemindars. In India, as in Ireland, until what may be called recent times, land belonged to families or communities, which held themselves to be composed of kindred; but by acts passed by our government, a class of mere tax-collectors have been converted into land-owners, in order to facilitate the collection of the revenue. Hence, there has arisen in India an agitation very much resembling that which prevails in the south of Ireland. The ryot claim of tenant-right was recently the subject of a suit before the supreme courts of India, when a majority of the judges favoured the equitable claim of the ryots. In countries where the people have been trained in notions derived from the Roman or feudal laws, there has been little heard of this species of claim of right, and land has been recognised by the people as being, like other things, a fair subject for contract.

In Scotland and in the north of England, farms are almost always let on long leases, and at such rents as are supposed to repay the tenant the capital which he may lay out in improvements; and the common case is, that the landlord binds himself to pay the tenant a stipulated sum as the value of his improvements, provided that these are found at the end of the lease to be of a certain stipulated value. Over England generally, on the other hand, tenancy can be ended by six months' notice on either side, and the evils incidental to this precarious tenure have been obviated or mitigated solely by the honourable conduct of the English proprietors. It is quite common in England to find that the son has succeeded the father as tenant at will for many generations, often for centuries.

With regard to Ireland, it is quite plain that in a country where two-thirds of the population is agricultural, any hindrance to agricultural trade must be felt with especial severity. Land must be indebted for its improvement either to the capital of the tenant or of the landlord. Now, according to Adam Smith, 'it seldom happens that a great

proprietor is a great improver. . . . To improve land with profit, like all other commercial projects, requires an exact attention to small savings and to small gains, of which a man born to great fortune, though naturally frugal, is seldom capable.' It must be chiefly, then, to the moral quality of the tenantry, and to the inducement held out to them by the state of the law, that a country has to look for the improvement of its land. It must follow, therefore, that the law by which the ownership of improvement follows the ownership of land, is in the present condition of things in the highest degree unjust and inexpedient. The tenant's interest in all his improvements ending with his tenancy, he is very unlikely, at least towards the end of his term, to spend anything on the land which will be of benefit to it; and where he is a tenant at will, he is entirely without interest to improve it.—See *Impediments to the Prosperity of Ireland*, by W. Neilson Hancock (Lond. 1850); also by the same author, *Causes of the Prosperity of the Lothians of Scotland* (Belfast, 1852).

TENA'SSERIM is (together with the province of Martaban) the third or southernmost division of British Burmah*—the other two divisions comprising the ancient kingdom of Pegu and Arracan. On the 31st January 1862, these three maritime provinces were united under one local administration, bearing the name of British Burmah.

T. is a narrow line of coast about 500 miles in length, with a varying breadth of from 40 miles at its southern extremity to 80 miles; the latter distance being measured from the sea-shore at the mouth of the Salween to the range of mountains on the east that separates T. from Siam. It extends from the point of junction of the Thoung-yeen River with the Salween to the Pak-chan River, in 10° 15′ S. lat., and from 97° 30′ to 99° 36′ E. long., with an area of 24,838 square miles.

The division of Tenasserim is divided into five provinces—viz., Toungoo, Schwe-gyen, Maulmain, or Amherst province, the chief civil and military station, Tavoy, and Mergui—which lie along the coast from north to south in the order in which they are here mentioned.

Physical Features.—The general aspect of the country is bold and picturesque. The numerous wooded ranges of hills take generally a course from north to south. The northern part of the country is the most level; the southern portion is little else than a wilderness of thickly-wooded hills, enclosing long and narrow valleys. The soil of the plains is very fertile, and suited to the growth of rice, indigo, cotton, sugar, and vegetables. Tobacco grows chiefly on the banks of rivers in the hills. Only about $\frac{1}{18}$th of the country is under cultivation, and the forests occupy two-thirds of the entire area. The chief rivers are the Salween, Gyne, Attaran, Yé, Tavoy, and Tenasserim. The Tenasserim, from which the country derives its name, is the most considerable river of the province. The principal ports of T. are Maulmain (q. v.), Amherst, Tavoy, and Mergui, of which Maulmain is the best. Amherst harbour, at the mouth of the Salween, affords good anchorage for ships of any draught of water, but is difficult of approach. The Mergui Archipelago, lying off the southern coast of T., consists of almost innumerable islets, some of which are said to be rich in iron ore; and they are famous for their edible birds' nests. Numerous anchorages are found amongst the islands. The country possesses vast stores of mineral wealth, which now lie absolutely neglected. Gold-washing has been pursued with success at the head of the Tavoy River. At Kahan, on Mergui Island, are rich and accessible tin-mines; and thousands of tons of good clean ore, yielding 75 per cent. of the pure metal, could be raised not far from the surface of the ground. A very productive iron ore is obtained from Iron Island, between Tavoy and Tiger Island. Mergui province furnishes a valuable lead ore, and has extensive fields of coal. Manganese has been found on the Tenasserim River, where it is believed to be very plentiful.

Botany.—The botanical productions of T. may vie with those of any part of the world. There are more than one hundred different kinds of timber-trees, of which the teak is the most important. The celebrated *Amherstia nobilis* is the most splendid of the many flowering and ornamental trees for which T. is famous. The palm tribe are in great variety, and Dr Griffith collected 1700 different species of plants in about 14 months.

The *climate* of T. is regulated by the monsoons; and the wet and dry seasons divide the year into two nearly equal parts. The average yearly fall of rain is about 194·28 inches, and this descends during the six rainy months from May to October. The greatest amount of rain ever recorded as having fallen in one day (27th May 1857) is 12·75 inches; and the gauge for the week registered 40·27 inches (Dr Walter). While the rains last, the temperature is very uniform, the thermometer ranging between 76° and 82°. The cool season lasts from the cessation of the rains in October, when the north-east monsoon begins, to the middle of February. During that time, the thermometer seldom reaches 90° in the shade, and occasionally falls as low as 56°, and now occurs the greatest thermometric range, which is sometimes as much as 30° in one day. The sun then gradually regains its power, and the heat increases daily till the south-west monsoon again brings clouds and rain. In the hot period, the thermometer at mid-day is not often below 92° in the shade, and not unfrequently stands at 95°.

Commerce.—The principal exports from T. are teak timber and rice. The trade of the province is, however, not on the increase, but, as it appears, rather the reverse. The first of these articles of export is not continuous from year to year; and we accordingly find that the decrease in the value of trade is owing to the diminished demand for teak timber. Indeed, the defective continuity of supply is to some extent a fact also as regards timber. Rice is the most reliable article of commerce.

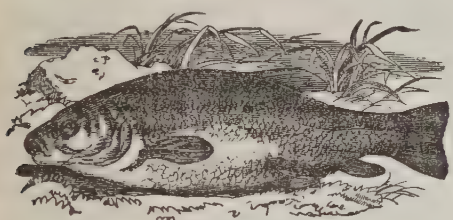
Inhabitants.—By the returns of 1872, the number of inhabitants of the five T. provinces is given as follows: Toungoo, 78,430; Schwe-gyen, 144,919; Amherst, 235,738; Tavoy, 71,494; Mergui, 46,184; total, 576,765. The bulk of these are Burmans proper; but there are, besides, many races and tribes—viz., Talaings, or descendants of the ancient Peguans; Karens, a dispersed people, inhabiting secluded mountain districts—among whom Christianity has made some progress, through the labours of American missionaries; Toungthoos, Khyengs, Shans, Europeans and their descendants, Chinese, and Indians. Throughout T. and British Burmah generally, inheritance and marriage are regulated by Buddhist law, while at the seaports the English mercantile law and law of contracts are in force, and regulate the decisions of the courts.—*The Natural Productions of Burmah and the Tenasserim Provinces*, by the Rev. F. Mason

* The provinces of British Burmah extend along the eastern shore of the Bay of Bengal from the Naf Estuary, in about 20° 50′ N. lat., to the Pak-chan River, in about 10° 15′, with a coast-line of 900 English miles. Their area and population, according to the returns of 1872, are as follows: Arracan, area, 18,530 sq. m., pop. 461,136; Pegu, area, 28,404 sq. m., pop. 1,524,422; Martaban and T., area, 36,750 sq. m., pop. 576,765.

A.M. (Maulmain, 1850); *Six Months in British Burmah*, by Christ. T. Winter (Lond. 1858); *The Tenasserim and Martaban Directory* (Maulmain, 1857); *Reports of the Administration of the Province of British Burmah, for* 1861, 1862, *and* 1863, by Lieut.-colonel A. P. Phayre, C.B., Chief Commissioner and agent to the Governor-general (Rangoon, 1862, 1863). Personal observation.

TE'NBY, a small parliamentary and municipal borough, and thriving watering-place, of South Wales, in the county of Pembroke, and 10 miles east of the town of that name. Its charming situation on a peninsula, overlooking the Bay of Caermarthen, its salubrity of climate, and the facilities for bathing which the extensive sands in the vicinity afford, have made it one of the best and most fashionable watering-places in Wales. A considerable part of the ancient embattled walls of the town still remains. There are also a handsome church and picturesque ruins of a castle. The season lasts from June till October, and the number of permanent winter residents is annually increasing. Fishing is extensively carried on. Pop. about 5000; but during the season the number is greatly increased.

TENCH (*Tinca*), a genus of fishes of the family *Cyprinidæ*, of a thick form, with small scales, and a barbel at each side of the mouth, the teeth on the pharynx compressed and club-shaped. The COMMON T. (*T. vulgaris*) is an inhabitant of ponds



Tench (*Tinca vulgaris*).

and other stagnant waters in Europe and the north of Asia. It passes the winter in a torpid state, concealed in the mud. It is of a deep yellowish-brown colour, more rarely golden or greenish. Instances have occurred of its attaining a length of three feet, but a T. of half that length is unusually large. It is very tenacious of life, and, like the carp, can be conveyed to a distance alive in wet moss. It spawns in May and June, depositing its spawn among aquatic plants. The ova are very small and very numerous. The flesh of the T. is soft and insipid, except when it is very well fed, when it becomes delicate and pleasant. It is commonly placed in ponds along with carp; a much smaller number of T. than of carp, however, being deemed sufficient to stock a pond. In Britain, the T. is found only in England, and there sparingly in some of the slow and muddy rivers. It is not improbable that it may have been originally introduced as a pond-fish, although it has long been naturalised. Angling for T. resembles angling for carp. The same kinds of bait are used.

TE'NDA, COL DE, a pass over the Maritime Alps. See ALPS.

TENDER, as a Legal term, means the formal offer to perform some obligation incumbent on the person tendering. It is more frequently used in reference to the payment of money which is due. Whenever a tender of the debt is properly made, the legal consequence is this, that if the money is refused the creditor will have to pay the costs of any action he may bring to recover it, and cannot claim interest afterwards. In case such an action is brought, the debtor has nothing to do but to plead that he duly tendered the money, and if he then pay into court the sum which he had formerly tendered, the other party must stop the action, or continue it at his own risk. In order, however, that a tender should have the above effect, it must have been duly made—that is to say, it must have been made without imposing any conditions on the creditor, and at the proper time and place. The tender must be in money, and not by bill of exchange; but Bank of England notes are good tender for all sums above £5. If the debt is beyond 40*s.*, it ought to be in gold, so far as it goes. Though other bank-notes than Bank of England notes are often tendered, the creditor is not bound to accept them; but if he take them without any specific objection, then it will be a sufficient discharge. A tender of a larger sum than is due is good, but must not require change to be given, which the creditor is not obliged to find. Nor must any condition be annexed to the tender, not even the condition of giving a stamped receipt, though on other grounds, by statute, a person receiving payment is bound to fill up a stamped receipt on its being tendered to him, and to pay the stamp; and his refusal to fill up the receipt subjects him to a penalty of £10. A tender of payment must, in general, be made to the creditor at the place he has indicated, and it is the duty of the debtor to find out and pay the creditor. With regard to payment of rent, however, it is enough that the tenant be ready to pay the rent on the premises at the time it is due, it being the landlord's duty to send or call for it, for the land is the proper debtor, and that is the place to apply to in the first instance.

TENDER, in Naval language, a small vessel appointed for the service of a larger one. Steam gunboats are most commonly employed as tenders.

TEN'DON is the term employed in Anatomy to designate the white fibrous tissue reaching from the end of a muscle to bone or some other structure which is to serve as a fixed attachment for it, or which it is intended to move. In accordance with their form, tendons have been divided into the three following varieties: (1) *Funicular*, or rope-like, as the long tendon of the biceps muscle of the arm; (2) *Fascicular*, as the short tendon of that muscle, and as the great majority of tendons generally; and (3) *Aponeurotic* or tendinous expansions, sometimes of considerable extent, and serviceable in strengthening the walls of cavities, as, for example, the tendons of the abdominal muscles.

The tendons commence by separate fascicles from the end of each muscular fibre, and they similarly terminate by separate fascicles in distinct depressions in the bones, besides being closely incorporated with the periosteum. In some birds, whose tendons are black, the periosteum is black also, from this incorporation. If a tendon is ruptured by an accident, or divided by the surgeon, the two ends, if not too far separated, unite with extreme readiness, by the formation of intervening plastic material, which soon acquires great firmness. So rapidly is this process of repair carried on, that, according to Mr Paget, a specimen, six days after division, could bear the weight of 25 lbs.; while in another specimen, the new material, at the end of 21 days, bore a weight of 56 lbs. When the interval between the two ends of a tendon exceeds a certain limit, there will be only an imperfect bond of union, and either a partial or total loss of the use of the muscle will result. For details regarding this process of repair which has an

intimate bearing on the treatment of ruptured tendons, the reader is referred to Mr. Paget's admirable *Lectures on Surgical Pathology*.

Amongst the diseases of tendons, *inflammation* requires especial notice. 'Tendons,' says Mr Tatum, in his article upon *Affections of the Muscular System*, 'together with their sheaths, are not unfrequently inflamed. Independently of gout and rheumatism, the most frequent cause is a sprain or wrench in the neighbourhood of a joint. These injuries are occasionally productive of long-continued wearing pains, assuming much of a rheumatic character, and yield often slowly and unwillingly to the remedies, both local and general, employed in rheumatism.'—Holmes's *System of Surgery*, vol. iii. p. 544. In one of the forms of Whitlow (q. v.), known as *Paronychia gravis*, or *tendinous whitlow*, 'the tendons and their sheaths in the finger and hand are the seat of a severe and often most destructive inflammation, which, though often confined to one finger, not unfrequently extends to the hand and arm, attacking not only the tendons and softer parts, but exposing the bones, and disorganising the joints.'—*Op. cit.*, p. 544. It arises from slight punctures or wounds, with or without the inoculation of irritant or poisonous matter, and often without any apparent cause, except a derangement of the general health. It begins with severe and throbbing pain in the palmar surface of a finger, which extends upwards along the arm. There is extreme tenderness, and a certain amount of redness and swelling, with great tenseness of the parts. If the inflammation is not checked, suppuration soon ensues, accompanied by much constitutional disturbance. The matter frequently extends amongst the muscles, and in bad cases, occurring in unhealthy persons, the bones and joints become affected in the way already mentioned. In the early stage, free leeching, followed by hot fomentations, may be useful. The hand should be kept elevated, and an active purgative, with low diet, prescribed. If, as is often the case, these measures are unsuccessful, a free incision must be made along the centre of the palmar aspect of the finger—an operation which gives extreme relief, by removing the tension, and allowing the escape of blood, even if little or no pus is discharged. A generous diet, stimulants, and tonics, are now advisable; and under this treatment the disease generally yields; although cases occasionally present themselves in which the suppuration produces such results as to render amputation of the arm necessary, or even to cause death. A permanently bent finger, from adhesion of the tendon to its sheath, is a common result in severe cases of whitlow of this kind.

Tendons are not very unfrequently the seat of syphilitic enlargements or tumours. Malignant tumours scarcely ever spring from tendons, but fibrous tumours and small cartilaginous enlargements are often found in tendons.

Rupture of the tendons is an accident which is frequently caused by violent muscular action, especially if, from illness or other causes, the muscles have been for some time in a state of inactivity. The long tendon of the biceps cubiti is very obnoxious to this injury, which, in this case, is more often due to the disorganisation caused by chronic rheumatic gout than to mere mechanical violence. The other tendons most frequently ruptured are the tendo Achillis, and the tendons of the rectus femoris and the triceps humeri. When a tendon is ruptured or divided by a surgical operation (tenotomy), 'the part which is attached to the muscle is drawn away from the opposite end for about an inch. Blood is poured out between the ends, but much less than in rupture of muscles. The pain is said not to be very great; a considerable shock, however, is felt, as from a blow received on the part, accompanied by cramp of the muscle, and a perfect inability to use the limb; and in rupture of the tendo Achillis, a feeling is described as if the heel were sinking into a hole in the floor.'—Holmes's *System of Surgery*, vol. iii. p. 541. The essential point in the treatment of ruptured tendon is to keep the injured part in a state of constant rest and muscular relaxation, so that the separated ends may be approximated as much as possible, and to prevent any violent extension till firm union, by the process of reparation, has been established. The special methods of treating individual cases (as rupture of the tendons of the rectus femoris and the triceps, and of the tendo Achillis) are discussed in Holmes's *System of Surgery*, and other standard works on surgery.

TENE'BRIO. See MEAL-WORM.

TE'NEDOS (Turk. *Bogdsha-Adassi*), an island belonging to Turkey in the north-east of the Ægean Sea, off the coast of the Troad, and about 17 miles south of the western entrance to the Strait of the Dardanelles. It is about five miles long by two broad, rocky, but not unproductive, with a pop. of more than 6000, who are partly Greeks and partly Turks. The chief town, also called Tenedos, or *Bogdsha*, on the north-east coast, is the seat of a Greek bishop and Turkish aga, and carries on an active trade in wine.

TENERI'FE, the largest of the Canaries (q. v.).

TENERIFE, PEAK OF, or PICO DE TEYDE, a famous dormant volcano, the highest summit in the Canary Islands, stands in the south-west of the island of its own name, and is 12,182 feet above sea-level. The lower slopes of the mountain are covered with forests, or laid out in extensive meadows, yielding rich grass; but the upper ridges, and the Peak, properly so called, are wild, barren, and rugged in appearance. The Peak and its two inferior neighbours, the *Montana Blanco* and *Chajorra*, rise from a rugged circular plain of lava debris and pumice, 7000 feet above sea-level, about 8 miles in diameter, and fenced in on all sides by an almost perpendicular wall of rock. From the crevices of these mountains sulphurous vapours are constantly exhaling. The Peak can be seen from a distance of upwards of 100 miles; but the view from it is generally destroyed by the dense masses of cloud which hang over the surrounding sea at an average elevation of 4000—5000 feet, the sky above being almost uniformly clear and bright. Mr Piazzi Smyth, in the summer and autumn of 1856, made here a series of experiments for the purpose of ascertaining how far astronomical observation could be improved by eliminating the lower third part of the atmosphere, and with this object observed for two months, first on Guajara (an elevated peak of the rocky wall, 8903 feet high), and afterwards on Alta-Vista (on the side of the Peak, 10,702 feet high). See *Tenerife*, by C. Piazzi Smyth (London, 1858).

TENÈS, a rising seaport of Algeria, 100 miles west of the city of Algiers. It is happily situated for commerce, is the entrepôt for Orleansville, and the depôt for the supply of the army with provisions. It is at once fortunate in the agricultural resources of its territory, in its mineral wealth, and its position in respect to transit-trade. The population of the commune is about 8000.

TENE'SMUS (from the Gr. *teinein*, to strain) is the term employed in Medicine to designate a straining and painful effort to relieve the bowels when no fæcal matter is present in the rectum; the effort being excited by some adjacent source of irritation. All that is got rid of by the straining, which usually occasions more or less descent of the

gut, is mucus, frequently stained with blood. Tenesmus is a common symptom in dysentery, irritation of the bladder, stricture of the urethra, &c.

TENIERS, DAVID, the Elder, a Flemish artist of note, was born at Antwerp in 1582. For some years, he was a pupil of Rubens; afterwards, he visited Italy, where he studied under Adam Elzheimer, and on his return, settled in his native city, where he died in 1649. The subjects of T.'s pencil are in general very homely, and often low—the interiors and exteriors of public-houses, smoking-rooms, rustic games, weddings, &c.; but they are executed in the most vividly realistic manner, with such charm of colour, and happy ease of composition, that they never fail to excite in the beholder a lively sense of pleasure. T. was almost constantly employed during his career as an artist.

TENIERS, DAVID, the Younger, son of the preceding, was born at Antwerp in 1610. He received his first lessons in art from his father, who, it is said, subsequently placed him in the studio of Adrian Brauwer; but this statement can scarcely be true, for Brauwer (q. v.) was only two years older than himself. It is probable that he derived most, if not all his professional instruction from his father, to whose genius his own bore a peculiarly filial resemblance. In fact, the elder T. may be considered the founder of a school of which the younger is the most brilliant and prolific member. The latter, like his parent, rapidly rose into distinguished consideration, enjoying in the course of his life the favour and friendship of the Archduke Leopold, Queen Christina of Sweden, Don John of Austria, the Prince of Orange, the Bishop of Ghent, and other dignitaries. T. lived for the most part in a villa on the outskirts of Malines, where he had abundant opportunities of studying closely that humble rustic life which he has so charmingly depicted in all its aspects; but he died at Brussels, 11th February 1685. He was twice married: first to a daughter of the painter Breughel (q. v.), *Velvet* Breughel as he was called; and again to the daughter of a councillor at the court of Brabant. The number of his pictures is something marvellous. Smith, in his *Catalogue Raisonné* has carefully described 685. England is peculiarly rich in specimens, but they are also liberally scattered over the galleries and private collections of the continent, and, in spite of their number, bring great prices. They possess, but in a superlative degree, the beauties of the elder T.'s pieces. In the colouring of his skies, the sketching of his trees, the animation and grouping of his figures, we see everywhere the presence of a richer, finer, more observant and more imaginative genius.

TENNANT, WILLIAM, still to be remembered as the author of *Anster Fair*, was born at Anstruther, in Fife, in the year 1785. A cripple almost from his birth, and doomed to propel himself through life on crutches, he betook himself naturally to study, as requiring no exertion of the limbs. In 1799, he went to the neighbouring university of St Andrews, where, however, he only remained two years, leaving it to join his brother, a corn-agent, in business. In this, his success was indifferent; and in 1813, he was fain to accept the situation of parish schoolmaster at Denino, a small hamlet about four miles from St Andrews, with a salary of £40 a year. The year before, he had published his *Anster Fair*, a poem of much sprightliness and humour, notable as the first attempt to naturalise in our language the gay *ottava rima* of the Italians; soon after adopted by Byron with such splendid success in his *Beppo* and *Don Juan*. The piece gradually made its way, and in 1814 a highly laudatory notice of it appeared in the *Edinburgh Review*, from the pen of the then omnipotent Jeffrey. In 1816, Mr T. became teacher of a school at Lasswade, near Edinburgh, whence, three years afterwards, he transferred his services to the Academy of Dollar, in Clackmannanshire. His attainments as a linguist were extraordinary; and in 1835 he was appointed Professor of Oriental Languages in the university of St Andrews—a post for which, perhaps, not many men then living had similar qualifications. In connection with his new duties, he published, in 1840, grammars of the Syriac and Chaldee languages He died, on 15th February 1848, at his residence near Dollar, where his summers were usually spent. He was one of the most genial and amiable of men. Besides other miscellanies in verse, he gave to the world, in 1822, *The Thane of Fife, a Poem;* in 1823, *Cardinal Beaton, a Tragedy;* and in 1825, *John Baliol, a Drama.* None of these later productions had much success, or did anything to increase the literary reputation which his first work had won for him.

TENNESSEE′, a southern state of the American Union, the third admitted under the federal constitution, extends in lat. 35°—36° 30′ N., and long. 81° 37′—90° 28′ W., and is bounded on the N. by Kentucky and Virginia; and on the S. by Georgia, Alabama, and Mississippi. Area, 45,600 square miles. The chief towns are Nashville (the capital), Memphis, Knoxville, Columbia, Murfreesborough, and Jackson. The principal rivers are—the Mississippi, forming the boundary on the west; the Cumberland (q. v.); the Tennessee River, which twice crosses the state; the Obion, Hatchee, and numerous branches of the larger rivers, which give navigation and water-power to the entire state. Eastern T. is crossed by several ridges of the Alleghany Mountains, some of which have elevations of 2000 feet; the middle region between the Cumberland and Tennessee rivers is hilly, and the west level. The western portion of the state, between the Mississippi and the Tennessee, is of the alluvial and cretaceous formation of the shores of the Atlantic and Gulf of Mexico. Extensive iron mines lie between the Tennessee and Cumberland rivers. In the limestone regions are numerous caves, mostly unexplored. Several in the Cumberland Mountains are 100 feet deep, and miles in extent. A considerable river has been discovered in one at a depth of 400 feet; another opening perpendicularly in a mountain has never been fathomed. In some of these caves are large deposits of fossil bones of extinct animals. In the Enchanted Mountain are seen impressions of the feet of men and animals in limestone. Tracts of several acres have sunk into caverns a hundred feet deep. In many places are interesting remains of ancient mounds and fortifications.

The climate of T. is temperate, and, except in some of the river-bottoms, salubrious. The soil of the whole state, except the eastern mountainous regions, is extremely fertile, producing cotton, tobacco, Indian corn, wheat, figs, peaches, grapes, and all the fruits and productions of the southern temperate regions. The state is richly wooded with pine, oak, hickory, sugar-maple, cedar black walnut; and the woods abound in game, as bears, deer, opossums, racoons, foxes, &c.; and the country is rich in horses, cattle, sheep, and swine—the last running in large herds in the woods, and fattening on nuts. In 1860, the lands of T. were valued at $271,358,985, and in 1870 at $218,743,747, showing a decline of $52,615,238. In 1870, the live stock was estimated at $55,084,075; and the crops consisted in part of 41,343,614 bushels Indian corn, 6,188,916 bushels wheat, 21,465,452 lbs. tobacco, and

181,842 bales of cotton. The commerce of the state, by its rivers and 23 lines of railway, is chiefly with New Orleans, St Louis, and Cincinnati. There are state asylums for the deaf and dumb at Knoxville, and for the insane and blind at Nashville. There are 51 colleges; a common-school income of $683,000; 3180 churches, chiefly Methodist, Baptist, and Presbyterian; 13 daily and 65 weekly papers. In 1870, the taxable property was $253,782,161; revenue, $3,381,579; state debt, $38,539,802.

In 1756, a settlement was formed near Knoxville, then a part of North Carolina. Nashville was settled near the close of the Revolution; in 1790, T. was organised as a territory with Kentucky; and in 1796 was admitted into the Union as a separate state. In January 1861, a proposal to secede from the Union was defeated, but in June it was carried by a majority of 57,667. In ten months the state raised 50 regiments for the Confederacy; 5 or 6 were also recruited for the Union. The state was the scene, at Knoxville and Chattanooga, of some of the most important operations of the war. In March 1870, a new constitution, recommending and providing for a common-school fund, was ratified by a large majority of the people. For some years after the close of the war of secession, portions of T. were in a disturbed condition, bands of disguised marauders forcibly entering houses and hanging and shooting citizens. The pop. of T., in 1800, was 105,602; 1820, 422,813; 1840, 829,210; 1860, 1,109,847, of whom 275,784 were slaves; 1880, 1,542,359.

TENNESSEE, a river of the United States, the largest tributary of the Ohio, has its origin in the union of the Clinch and Holston, which rise in the Alleghany Mountains of South-western Virginia, and flowing south-west in two parallel valleys, unite at Kingston in the west of Tennessee state. The river flows still south-west, in the Alleghany valley, entering Alabama close by the north-west corner of Georgia, whence it flows 60 miles further in the same course, then turning to the west-north-west, re-enters Tennessee at the north-east corner of Mississippi, flows northwardly across the state, then north-west across Kentucky to its confluence with the Ohio at Paduca; length 800 miles, or, from the source of the Holston, 1100. Its chief branches are the Sequatchie, Paint Rock, Flint, Duck, North Branch, Hiawassee, Big Sandy, and Clark's. It is navigable 259 miles to Mussel Shoals—a series of broad shallow rapids—and 500 miles above. Chief towns, Florence and Decatur, in Alabama; and Chattanooga, Tennessee.


Tenney.

TE'NNEY, in Heraldry, orange colour, one of the tinctures enumerated by heralds, but not of frequent occurrence in coat-armour. It is indicated in engravings by lines in bend sinister, crossed by others barways.

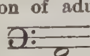
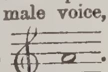
TE'NNIS, a game of great antiquity, belongs to the class of ball-games, and finds its analogies in the *sphairisis* of the Greeks, and the *pila* of the Romans. Under the name of *paume*, a name given to it from the ball being at that time struck with the palm of the hand, it is noticed in the Arthurian romances, and in the earlier records of the dark ages. In the 15th c., it was in great vogue in France among all classes, from the monarch to the meanest of his subjects; and about this time the use of a heavy glove to protect the hand in striking the ball was introduced, and a further improvement was subsequently effected by the adoption of the *racket*. The game in England kept pace with its progress in France, and during the 16th, 17th, and 18th centuries, was generally practised under the name of *tennis*, especially by the higher classes. Many modifications have been introduced from time to time, and the legitimate descendant of the paume and tennis of former days is the present game of rackets. 'Rackets' is played in a court 96 or 97 feet long, by 33 or 34 feet wide, and surrounded by walls sufficiently high to prevent the balls from being lost. The players are either two in number, or four divided into two parties. The player or party 'in' *serves* the ball against the head-wall of the court, so as to rebound over a line drawn at a certain distance; it is returned by means of the racket by the player or party 'out,' who must make it rebound from the wall to the other side of the line; and the game is thus carried on till one player fails to strike the ball or cause it to rebound properly. If the player 'in' fails, he changes places with the player 'out;' if the latter fails, the former scores a point. The part of the court on which the player or party in is placed is called the 'service' side; the other, the 'hazard' side. A similar game played without the racket is called *fives*, *hand-tennis*, or *hand-ball*.

TENNYSON, Alfred, was born in the year 1810 at Somersby, in Lincolnshire, of which parish his father was rector. He was the third of a large family, several other members of which shared with him in some measure the genius which has won for him undisputed rank as the first English poet of his time. Very early, the bent of nature became obvious; and in 1827, T., along with his brother Charles, issued a small volume, entitled *Poems, by Two Brothers*, of which almost nothing has been preserved. Having gone to complete his education at Trinity College, Cambridge, he gained in 1829 the Chancellor's Medal by a poem in blank verse, entitled *Timbuctoo*, in which there is plainly to be traced some impress of his peculiar genius. His literary career, however, may properly be said to date from 1830, in which year a volume appeared of *Poems, chiefly Lyrical*, by Alfred Tennyson. It was not received with great favour by the public; but amid much that was weak and immature, it contained pieces which in no indistinct manner announced the advent of a true poet. In a notice of the book by Professor Wilson, in *Blackwood's Magazine*, the promise of the young writer was recognised in sufficiently express terms. The praise was, however, not unmixed with censure, which, though it seemed on the whole judicious, did not commend itself as such to the poet, who retaliated on 'crusty Christopher' in his next volume, published in 1833. This consisted of a selection of poems from the previous one, carefully retouched by the writer, with the addition of pieces produced in the interval, many of which have scarcely been surpassed in beauty by anything he has since produced. Onward from this time, the reputation of the writer slowly but surely extended itself; and the publication, in 1842, of *Poems, by Alfred Tennyson*, in two volumes, raised him to the position of absolute supremacy which he has ever since continued to occupy by almost universal consent. In these he included whatever in his earlier issues he deemed worthy of preservation, and the work was substantially what we now buy as *Tennyson's Poems*. In 1847 appeared *The Princess, a Medley*; and in 1850, the series of elegies entitled *In Memoriam, A. H.*, a tribute of affection to the memory of Arthur Hallam, a son of the eminent historian, and the chosen friend of the poet in his earlier years at Cambridge. On the death of Wordsworth, in 1850, T. succeeded him as poet-laureate, in which capacity he issued, in 1852, his *Ode on the Death of the Duke of Wellington*, a piece which, as in a manner 'done to order,' can scarcely take rank as one of his happiest

effusions. This—if we except some simple and touching lines, evoked by the death of the Prince Consort—is happily the sole attempt hitherto made by T. in emulation of Pye and others. In 1855 appeared *Maud, and other Poems.* The immediate reception of this little volume was not enthusiastic. While many of its lyrics instantly caught the public ear, *Maud*, as a whole, at first rather puzzled the critics, and was little better than 'caviare to the general;' and though since it has risen in estimation, the subtle and recondite art exhibited in the structure of the poem is probably even now appreciated by only a few of its admirers. But for any little falling off in T.'s popularity on this occasion, a noble *amende* was made him on his next appearance. *The Idylls of the King*, published in 1859, were everywhere received with enthusiasm. This work at once took rank as one of the noblest poems in our language. In 1864, we had from T. a volume, containing *Enoch Arden*, one of his most finished and successful works; *Aylmer's Field;* a short piece, *Tithonus*, consummate in its beauty and finish; in 1870, *The Holy Grail; Pelleas and Ettare;* and *The Windows or Songs of Wrens*, set to music, which appeared the same year; and in 1872, *The Tournament* and *Gareth and Lynette.* T. has lived for the most part retired, not much caring to cultivate 'society,' by itself so called, but greatly beloved, it is understood, by the circle of his more intimate friends. In 1850 he was married to Miss Emily Sellwood, and subsequently resided in the Isle of Wight until 1869, when he removed to Petersfield, Hampshire. In 1883 he was raised to the peerage as Baron Tennyson d'Eyncourt of Aldworth.

It is not an easy matter to criticise the poetry of T. dispassionately, so deeply is one apt to become enamoured of its beauties. His verse is the most faultless in our language, both as regards the music of its flow and the art displayed in the choice of words. Nowhere in literature is the *callida junctura verborum* so wondrously seen. As a painter, no modern poet has equalled him. But it is neither to his colour nor to his music alone that he owes his great popularity. His *virtue* as a poet doubtless lies in these things; but the pleasure which his poetry gives springs largely from the cordial interest he displays in the life and pursuits of men, in his capacity for apprehending their higher and more beautiful aspirations, and in a certain pervasive purity and strength of spiritual feeling.

TE'NON, in Carpentry, the square end of a timber, reduced about ⅓d its thickness, to fit the mortise or socket in another timber, so as to join the two together.

TENOR, in Music, one of the four classes into which voices are divided in respect of their compass. It is the higher description of adult male voice, and generally extends from  to . Music for tenor voices is most properly written on the tenor or C clef, , in which its principal tones come within the staff; but the treble clef is occasionally used, with the notes written an octave above their true pitch.

TENO'TOMY, or the Division of Tendons, is a comparatively recent surgical operation, whose object is to relieve some variety of deformity by severing a permanently contracted muscle at its tendinous portion. The invention of subcutaneous tenotomy is due to Stromeyer (1831), and a lucid account of the history of this operation is given by Dr Little in his *Treatise on Club-foot and Analogous Deformities* (Lond. 1839). The various kinds of knives that have been devised for severing tendons are termed *tenotomes.* The affections in which tenotomy is advantageously employed are club-foot, contractions of the upper extremity from spasm and paralysis, deformity from diseases of the palmar fascia, torticollis or wry-neck, anchylosis of the knee and other articulations, and squinting.—For further details, the reader is referred to the above-mentioned work by Dr Little, and to the same author's treatise *On the Deformities of the Human Frame* (Lond. 1853).

TE'NREC, or TANREC (*Centetes*), a genus of Mammalia, nearly allied to moles and hedgehogs, usually ranked in the family *Erinaceidæ.* The tenrecs are incapable of rolling themselves up like hedgehogs. They are nocturnal animals, natives of Madagascar and the Mascarene Isles. Three species

Tenrec (*Centetes ecaudatus*).

are known. They are remarkable for spending the hottest part of the year in a dormant state, as some animals in arctic regions spend the winter. Their flesh has a very peculiar flavour, but is acceptable to the natives of Madagascar.

TENSE (Fr. *temps*, from Lat. *tempus*, time), in Grammar, designates a set of changes which verbs undergo in order to mark the time of the action. See CONJUGATION.

TENT (Lat. *tentorium*, from *tentus*, stretched). Without speculating on the relative priority of tents and other forms of human dwellings, it is safe to assume, that among nomadic tribes, some shelter, easily framed and portable, must have been felt to be a primary necessity. The skins of animals, or the larger kinds of foliage, would form the earliest coverings, for which textile fabrics would be substituted as civilisation advanced. In the book of Genesis, the patriarchs, Noah, Abraham, Lot, Isaac, Jacob, are represented as dwelling in tents, probably much the same as the modern Arab tents, which are large structures, very

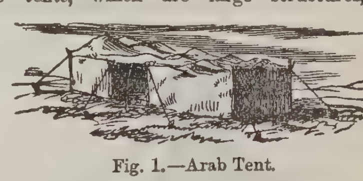


Fig. 1.—Arab Tent.

rude in form, covering a considerable space of ground, but of small height. Among the Nineveh sculptures is a representation of the tent of King Sennacherib, which, like modern tents, was supported by ropes: numerous tents of the officers and common people are likewise shewn.

The early Greek, and afterwards the Macedonian

tents were small coverings of skins, under each of which two soldiers slept. Alexander the Great is said to have had a pavilion of extraordinary magnificence. Its roof, one mass of gilded embroidery, was sustained by eight pillars covered with gold. In the centre, was the royal throne; and 100 beds could be made up within the temporary edifice.

The Roman soldiers seem to have used two sorts of tents—one, a tent proper, of canvas or some analogous material, and constructed with two solid

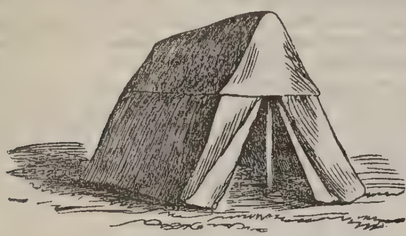


Fig. 2.—Roman Tent.

upright poles, and a roof-piece between them; the other, more resembling a light hut, of a wooden skeleton, covered by bark, hides, mud, straw, or any material which afforded warmth. Of these tents, the poles of the first would have been too cumbrous for carriage, and were probably cut afresh at each halting-place; the latter was evidently unsuited to removal, and was most likely only erected for winter-quarters, or a long sojourn. The Roman tent held 10 soldiers, with their *decanus*, or corporal.

In Persia, there are many tribes who pass their whole time in tents, which, naturally, they have brought to considerable perfection. They make them nearly hemispherical, with a wooden framework, and covered with felt, while worked hangings close the aperture. This felt admits of the exhibition of much taste in its decoration.

The Chinese lower orders live much in tents. They are ordinarily of matting. These people are

Fig. 3.—Chinese Tent.

clever in their construction, and make them of great size, and with considerable comfort.

Modern military tents are all made of linen or

Fig. 4.—Bell-tent.

cotton canvas, supported by one or more poles according to shape, and held extended by pegs driven into the ground. British tents comprise the hospital-marquee, a large oblong tent with high side-walls; and the round-tent, or bell-tent, for troops. The latter is 12 feet 6 inches in diameter, 10 feet 4 inches high, weighing, with all its appurtenances, 68 lbs., and giving sleeping accommodation to 16 men; the appurtenances comprise 2 mallets, 50 pins, 20 ropes, 20 loops, and 2 long ropes, for use in storms in giving additional firmness round the central pole. In modern tents, there is a low side-wall of canvas, to give greater room inside. These tents are said to be comfortable and moderately healthy, if floored with tarpaulin, vulcanised india-rubber, or other waterproof material. The great drawback is the tendency to blow over. To obviate this, and the inconvenience arising from the conical shape, Major Rhodes, a British officer, has invented a new tent, which has found much favour with the military authorities of this and other countries. He does away with the

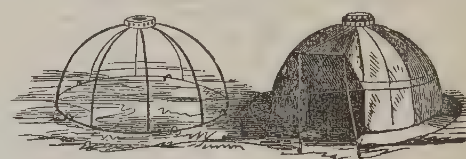


Fig. 5.—Major Rhodes's Tent.

central pole, and has a circular frame, hingeing in the centre like the ribs of an umbrella, over which the canvas is stretched. It is claimed for this tent, that it is more roomy than the regulation-tent, in proportion to its weight, is better ventilated, and possesses far greater stability.

TENTA'CULITES, a genus of obscure annulated tapering shells, found abundantly in some strata of Silurian age. They are generally referred to annelids, but the structure of the shell seems to exhibit greater affinities to recent pteropodous molluscs.

TE'NTERDEN, a municipal borough and market-town in the Weald of Kent, 18 miles south-south-east of Maidstone. The church, which contains portions of Early English, is surmounted by a massive and lofty perpendicular tower. Tradition asserts, that a quantity of stones, which had been got together for the purpose of strengthening the sea-wall of the Goodwin Sands, were employed in the building of this tower, and that when the next storm came, the district of Goodwin Sands, which had formerly belonged to the mainland, was submerged. Thus arose the popular saying, that 'Tenterden steeple was the cause of the Goodwin Sands.' Pop. (1881) 3620.

TENTERDEN, Charles Abbott, Lord, a distinguished English lawyer, was born at Canterbury, on the 7th October 1762. He was the son of a hairdresser. Being admitted on the foundation of the King's School connected with the cathedral, he distinguished himself by perseverance and extreme accuracy. A small exhibition in the gift of the chapter enabled him to proceed to Oxford, where, in 1781, he was elected scholar of Corpus Christi College; and a few years later, he obtained what were then the chief distinctions at the university, the Chancellor's two gold medals, one being for English, the other for Latin composition. In due time, he became a Fellow of his college. After being a student of the Inner Temple, in 1795, he was called to the bar. He joined the Oxford circuit; and in spite of a husky voice, a leaden and unmeaning countenance, and painfully timid manners, his great activity of mind, good taste, scholarship, scientific and legal

knowledge, were soon appreciated, so that he rapidly acquired a large business. He published, in 1802, his treatise *On Merchant Ships and Seamen*, in all respects the best written book which had till then appeared on one department of English law. It had the effect of increasing his employment in the more lucrative mercantile causes; and in 1807, it appears from his income-tax return that his fees amounted to upwards of £8000. In 1816, he accepted a puisne judgeship in the Court of Common Pleas; and in 1818 he was knighted, and chosen to succeed Lord Ellenborough as Chief-justice of the King's Bench. As a judge, his most marked characteristic was his evident impartiality and freedom from bias. The comparative leisure he enjoyed on the bench he spent in reading the classics and in the study of botany. He was, in 1827, raised to the peerage. In the House of Lords he was the most influential speaker against the Catholic Relief Bill; and in his last speech, he made a vow that if the Reform Bill, that 'appalling bill,' passed, he would never again take his seat as a peer. The success of the measure, it is believed, affected his health. He was seized with a violent attack of inflammation in November 1832, when presiding at the trial of the mayor of Bristol for misconduct during the riots, and he died there on the 4th of that month.

TENUIRO'STRÉS, a tribe or sub-order of birds, of the order *Insessores*, characterised by a lengthened slender bill, which is sometimes straight, sometimes curved. Some of them feed on insects, some chiefly on the honey of flowers. To this tribe belong the Creepers (*Certhiadæ*), Sun-birds (*Cinnyridæ*), Humming-birds (*Trochilidæ*), and Hoopoes (*Upupidæ*).

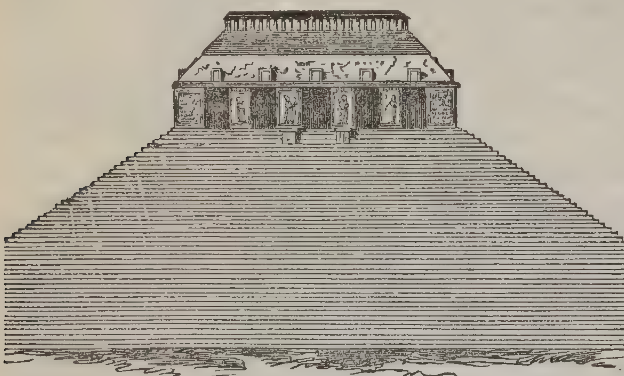
TENURE OF LAND, in England, was an accompaniment or immediate consequence of the Feudal System (q. v.) established during the middle ages throughout the greater part of Europe. Feuds were introduced by the barbarous tribes who poured themselves into the Roman Empire during the 4th, 5th, and 6th centuries. The chief feature of feuds was, that the lands of the conquered country were parcelled out to the leaders, on the condition of bearing arms whenever the sovereign required them. The relation thus created between sovereign and vassal was called a feud. The grantee held his lands at first for life only, but gradually it was developed into a hereditary character, and also into one which admitted of subinfeudation, i. e., the parcelling out of the feudal land among vassals of the head vassal, who was the lord of his own vassals. This kind of relation between lord and vassal gradually was extended to all kinds of land, for the owners of allodial land voluntarily surrendered their land to some lord, so as to have the same advantages. The vassal did homage to the lord, and took the oath of fealty. Besides these characteristics, the holding came to be attended with the following incidents. 1. An aid, which was a payment granted to help the lord in his necessities. 2. A relief was a tribute paid by a new tenant on succeeding to his predecessor. 3. A fine was paid by a tenant to the lord on alienating the lands to a purchaser. 4. An escheat or forfeiture was the reverting of the estate to the lord when there was a failure of heirs or some violation of duty on the part of the vassal. The feudal system was extended to England by the Norman barons soon after the Conquest, with the concurrence of William I., much to the dislike of the Saxons, whose grievances grew until they found vent in Magna Charta, which was in fact an attempt to restore their earlier constitution. The chief fiction, however, of a relation between the crown and the holders of land was not got rid of. The crown was nominally the lord paramount, and there were intermediate lords called mesne lords, of whom the tenants held. Gradually, the kinds of tenure were classed under free and base services—the former being those which a freeman might perform, as serving in war, or paying a sum of money; the latter, such as a peasant might perform, such as ploughing the lord's land, &c. These were afterwards further distinguished according to the certainty or uncertainty of the extended services to be performed. Ultimately, the tenures were classed as three. 1. *Knight-service*, or chivalry, i. e., holding on condition of serving in the war, and taking the oath of fealty. This was accompanied by the incidents of descent, wardship (or guardianship of the knight's heir by the lord), marriage (i. e., the lord's right to give the knight's infant in marriage), aids, reliefs, primer seisin (i. e., one year's profits from an heir on his succession), fine, escheat, and forfeiture. These incidents gradually grew irksome. James I. proposed to commute knight-service into an annual fee-farm rent; but this not being done, the statute of 12 Ch. II. c. 24 swept the whole away, and converted it into free socage. 2. *Free socage* was a tenure by some certain and determinate service, as by paying a small fixed rent, or ploughing the lord's lands for a fixed number of days. The incidents were rather less burdensome than those of knight-service, being descent, wardship, marriage, and reliefs, primer seisin, fines, escheat, and forfeiture. These incidents were all abolished by the above statute of 12 Ch. II. c. 24, and the tenure of free socage is now generally known as freehold. 3. *Villenage service*, or Copyhold Tenure (q. v.), which still exists nearly in its original state. The result is, that in England at the present day the two tenures are freehold and copyhold. The leading characteristic of freehold is, that practically the feudal relation between the crown and the holder is cut off, and the holder is entirely his own lord and master, can sell the estate, devise it by will, give it away, and do what he likes with it free from any interference or payment to the crown. As to copyhold, the feudal relation is kept up to a certain extent between the lord and the copyhold tenants, who must in form pay rents more or less nominal, and fines and Heriots (q. v.) to the lord on alienating the lands or succeeding thereto. Yet, practically, the copyholder does not materially differ from a freeholder except that he is liable to these petty and harassing acknowledgments towards a stranger; and by recent statutes, he can compel the lord of the manor to commute these fines and incidents, and convert the tenure into freehold.

In Ireland, the tenure of land is almost identical with that in England.

As to Scotland, there is a marked difference between the tenure of lands there and the tenure in England. At the present day, the feudal system prevails to a great extent, resembling in many respects the English copyhold tenure. Every piece of land there has generally its lord or superior and its vassal, that is to say, the vassal has the *dominium utile*, or actual enjoyment, while the superior has a kind of superior interest, or *dominium directum*, which consists in his drawing a rent called a feu-duty, which the vassal is bound to pay, or to forfeit the land. On each alienation or death of the vassal, there must be certain forms superadded, implying a consent or recognition by the superior, and certain casualties or additional payments must be made on such occasions. Recent statutes have tended to extinguish several of these superfluous forms, and make the vassal more independent. But a great many remain unaltered. And not only is there this feudal relation between the crown and its vassals, but these may subdivide the property and create

intermediate estates without limit, each vassal being in turn the superior to his subvassal; and this endless chain of relationships complicates the conveyancing still more. See CONVEYANCING; FEU.

TEOCA'LLI (House of God), the name given to the temples of the aborigines of Mexico, of which many still remain in a more or less perfect state. They were built in the form of four-sided pyramids, and consisted for the most part of two, three, or more stories or terraces, with the temple, properly so called, placed on a platform on the summit. The largest and most celebrated is the pyramid of Cholula, measuring 1440 feet each way, and 177 in



Teocalli at Palenque.

height; it is much defaced, and the temple on its summit has been removed. The teocallis in Yucatan are in far better preservation; they are not generally built in terraces, but rise at an angle of 45° to the level of the platform, with an unbroken series of steps from base to summit. The temples on their summit are sometimes ornamented with bas-reliefs in stucco and hieroglyphic tablets, and the roof is formed by courses of stone approaching each other, and furnished with projections like dormer windows. The preceding woodcut gives the elevation of a large teocalli of this kind at Palenque, on a scale of 50 feet to the inch. Not unlike the teocallis are the palaces of the Aztec kings or chiefs, which differ from them in having the pyramid smaller, less prominent, and oblong in plan, while the building, larger and more elaborate, consists for the most part of a stone basement, with square doorways, but without windows, surmounted by a structure which appears to be directly copied from wood-work. On some of these façades, we have also rude pillars and grotesque carvings, and there are often a number of chambers in the interior. A palace and temple are sometimes found attached together; and in a few cases, the most remarkable of which is the Casa de las Monjas, at Uxmal, the buildings stand round a courtyard. See MEXICO.

TEPIC, Mexico. See SUPPLEMENT in Vol. X.

TERA'MO (anc. *Interamna*), a town of Southern Italy, in the province of Abruzzo Ultra I., at the junction of the Tordina and Vezzola, 28 miles north-east of Aquila. It is well-built, with long and rather wide streets, has a cathedral, a public library, a foundling-hospital, and a botanic garden, carries on an active trade in corn, wine, and olives, and has a population of 19,721.

Ancient *Interamna* (of which the name T. is an Italianised form) was a city of Picenum, in the territory of the Prætutii. In the middle ages, it also bore the name of Abrutium or Aprutium (supposed to be a corruption of Prætutii), whence the modern name of the district, Abruzzo. Vestiges of the ancient city—the amphitheatre, temples, baths, aqueducts, &c.—are traceable, and many statues, altars, and inscriptions have also been discovered. In the plain below T. took place, July 27, 1460, between the army of John, Duke of Anjou, and the Milanese allies of Ferdinand I. of Aragon, one of the most sanguinary battles ever fought in Italy. After the contest at Castelfidardo (1860), T. was the first Neapolitan city that opened its gates and gave joyful welcome to King Victor Emmanuel.

TE'RAPHIM (Heb. plur.), a word of uncertain derivation (connected by some with Serapis), denoting certain images, idols, or household gods occurring in the Old Testament, which were consulted as oracles, and probably even worshipped to a certain extent. The gods which Rachel stole are called Teraphim, and Saul was reproached by Samuel for stubbornness which is like Teraphim; his daughter placed a Teraph into David's bed to conceal his flight, &c. There is no proof that this veneration for Teraphim was not held perfectly compatible with the worship of Jehovah, spite of some reformatory attempts to sweep them away. Many and curious have been the explanations given of the nature of the Teraphim by different scholars in and out of the synagogue. A vague but generally prevailing notion is that of their having been a kind of astrological automata, which somehow or other could be made to move, and to utter certain sounds. All that is certain, however, is only the fact, that the real meaning and character of this strange idol had been forgotten already at a very early period.

TERATO'LOGY (Gr. *terata*, wonders, or monsters) is a term used in Physiology as synonymous with 'The History of Monstrosities or Anomalous Formations.' See MONSTROSITY.

TE'RBIUM, a very rare metal, whose oxide, *Terbia*, is found in association with the rare earth Yttria, the oxide of Yttrium (q. v.).

TERBURGH, GERHARD, a Dutch painter, belonging to an old and respectable family of Zwoll, was born in 1608, studied first under his father, who was also an artist of note, and afterwards visited Germany, Italy, Spain, England, and France. On his return to his native country, he settled at Deventer, of which town he became burgomaster, and died in 1681. The elegant ostentatious life of his time, with its superfine courtly manners, and splendid costume, found in T. an admirable painter. The central figure in many of his pictures is a young lady with fair hair, and dressed in white satin. His most famous piece, however, is a picture containing portraits of the 69 plenipotentiaries who drew up the Treaty of Westphalia. In Dr Waagen's opinion, T. is the real founder of the art of painting conversation-pieces, and at the same time the most eminent master in this style. 'In delicacy of execution, he is inferior to none; and in a certain tender fusing of the colours, he excels all others; but none can be compared with him in the enchanting harmony and silvery tone, and the observance of the aërial perspective. His figures, which are well drawn, have an uncommon ease of refinement, and are frequently very graceful.' T.'s works are to be found in various English collections, particularly those of Sir Robert Peel, the

Duke of Sutherland, Lord Ashburton, Mr Hope, the Marquis of Bute, and Her Majesty; as also in the galleries of Dresden, Munich, Vienna, the Louvre, Amsterdam, and Berlin.

TERCE (Lat. *tertia*—i. e., *hora*, the third hour), one of the 'Lesser Hours' of the Roman Breviary, so called from the time of the day for which it is fixed. See CANONICAL HOURS.

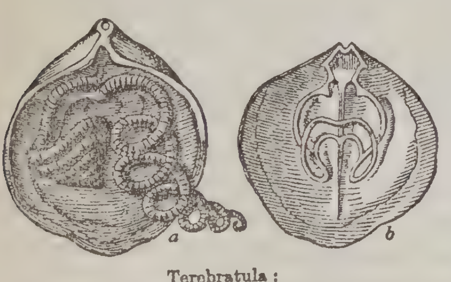
TERCE, in the Law of Scotland, is the interest or estate which a widow has in the land of her deceased husband at common law. This amounts to a liferent of one-third of such estates. In estimating the estate of the husband, all real burdens must be first deducted, and certain other things—as the mansion-house, if there is only one, superiorities, and patronage, leases, and feu-duties. The mode by which a widow completes her title to the terce is by a process called *kenning to terce*, the object of which is to separate her portion from the rest, which goes to the heir, so that each may possess independently his and her portion respectively. She is then in the position of an ordinary proprietor for life. Though terce is a legal right, yet this right of the widow may be modified by an antenuptial contract, under which she is otherwise provided for.—In England and Ireland, a widow has a similar right, called Dower (q. v.).

TERCEI'RA, one of the Azores Islands (q. v.), and the second in size of that group, forms one of the central cluster, and lies eastward from San Jorge. Area, 220 sq. m.; pop. between 40,000 and 50,000. Steep rocks of lava almost everywhere line the coast; the island is accessible only at few places, and these are defended against invasion by fortifications. The soil is fertile; the plateaux of the mountains afford excellent pastures, and cattle-breeding is an important branch of industry; the principal articles of export are wine, timber, and orchil. Chief town of the island, Angra, the capital (pop. 18,000), in the fort of which reside the governor and the bishop of the Azores.

TEREBINTA'CEÆ. See ANACARDIACEÆ.

TEREBRA'NTIA, a section of the insect order *Hymenoptera*, distinguished by the females having an ovipositor. To this section belong Sawflies (*Tenthredinidæ*), Ichneumons, Gall-insects, &c.

TEREBRA'TULA, a genus of deep-sea brachiopodous mollusca. The animal is attached to the shell by a pedicle, and the brachial disc is three-lobed, the centre lobe being elongated and spirally convoluted. The shell is smooth, with a truncated



Terebratula:
a, valve with the spiral arms; b, valve with arms removed.

perforated beak, the foramen being circular. The shelly loop is very short and simple. The shell of this genus, and some of its allies, is covered with minute quincuncial perforations, sometimes visible to the naked eye, but usually requiring a lens of a low power to distinguish them. The generic title is now restricted to shells with a short internal loop. The species with long loops are grouped together under the name *Waldheimia*. Of the restricted genus, there is only a single living species (*T. vitrea*); but the fossil species are more than a hundred in number, and are found in all periods of the earth's history, from the Devonian age upwards.

TERE'DO, a genus of lamellibranchiate molluscs of the family *Pholadidæ*; very much elongated, and worm-shaped; the mouth very delicate, open in front and at its lower part, for the passage of the short foot; the shell rather thick, equivalve, destitute of hinge, gaping at both ends. The species are rather numerous, and are generally known by the name of SHIPWORM or PILEWORM, because they

Common Shipworm (*Teredo navalis*).

perforate and live in timber. Their perforations are made in the direction of the grain of the timber, except when a knot is met with, or the shell of another *Teredo*, when they accommodate themselves to circumstances by bending. The cavity is lined with a calcareous incrustation. The aperture by which the T. enters is small, and it grows within the cavity which it makes. Two small valves form the true bivalve shell; the calcareous tube encloses the worm-shaped body of the animal. Its growth is very rapid, and its ravages are often terrible. A piece of deal has been found riddled by shipworms after forty days' immersion. Ships, piles, and all submarine woodwork are destroyed by it. Copper-sheathing is employed to protect ships from the shipworm, or the timber is driven full of short, broad-headed nails, the rusting of which forms a coating which it does not penetrate. The dykes of Holland have been threatened with destruction by its ravages. The COMMON SHIPWORM (*T. navalis*) is said to have been introduced into Europe from warmer climates. It is now, however, extremely abundant in European seas. In the East Indies, a very large species (*T. gigantea*) is found, generally in shallow water among mangrove trees; it is sometimes more than five feet in length, and at the thickest part three inches in diameter.

TERE'K, one of the most considerable streams of the Caucasus, rises near the lofty Mount Kasbec (about 17,000 feet high), flows north-west through the defiles of the mountains, crossing the district of the Kabarda, and reaches the border of the government of Stavropol, where it curves eastward, forming the south boundary of that government, until, reaching Kisliar, it divides into numerous branches, which form a delta 70 miles broad, and 50 miles long from apex to base, and falls into the Caspian Sea. It is not navigable. Total length estimated at from 300 to 390 miles.

TEREN'TIUS A'FER, PUBLIUS, the comic poet, was born at Carthage, 195 B. C. By birth or purchase, he became the slave of the Roman senator P. Terentius Lucanus, who, out of regard to his handsome person and unusual talents, educated him highly, and finally manumitted him. On his

manumission, he assumed, of course, his patron's *nomen*, Terentius. His first play was the *Andria*, written in his 27th year, but not acted till 166 B. C. Its success was immediate, and introduced its author to the most refined society of Rome, where his engaging address and accomplishments made him a particular favourite. His chief patrons were Lælius and the younger Scipio, after living with whom in great intimacy for some years in Rome, he went to Greece, where he translated 108 of Menander's comedies. He never returned; and the accounts of how he came by his death are conflicting. He is supposed to have died in his 36th or 37th year, leaving one daughter. Six comedies are extant under the name of T., which are perhaps all he produced—viz., *Andria*, *Hecyra*, *Heauton-timoroumenos*, *Eunuchus*, *Phormio*, and *Adelphi*. In conjunction with Plautus, T., on the revival of letters, was studied as a model by the most accomplished play-writers. His language is pure almost to being immaculate, and though inferior to Plautus in comic power, he is more than his match in consistency of plot and character, in tenderness, in wit, and in metrical skill. His plays have an educational value, as dividing, with the works of Cicero and Cæsar, the honour of being written in the purest Latin. They have been translated into most of the European languages. The best editions are those of Bentley (Cambridge, 1726), and the recent one of Parry (1857).

TERESA, St, one of the most remarkable of the female saints of the modern Roman calendar, and the most admired of the modern mystic writers of that communion, born at Avila, in Old Castile, March 28, 1515, was the daughter of Alfonso, of the noble House of Sanchez de Ceyeda. Even as a child, T. was remarkable for piety of a most enthusiastic kind; and when she was but seven years old, she and her little brother, Rodrigo, fled from her father's house, with the design of offering themselves for the crown of martyrdom among the Moors, but were overtaken, and restored to their parents. Her mother died while she was still young, and she was educated in a convent at Avila, from which, however, she was compelled by illness to return home when she was in her 16th year. During her illness, she resolved, notwithstanding the very earnest opposition of her father, to become a nun, and having in her 18th year entered a convent of the Carmelite order in her native city, she made her solemn vow on the 3d November 1534. In this convent she continued to reside for nearly thirty years, but it was not till about the year 1539, that her constitution became strong enough to permit her to follow, even in an imperfect way, the observances of conventual life. Her own account of her mental and spiritual condition during this period, which extended to the year 1555, is extremely interesting, and, like the confession of St Augustine and other saints, has furnished endless materials to the spiritualists of more recent times. The change of heart and of purpose came in 1555—1556, and was as complete and decisive as her former condition had been purposeless or fluctuating. After a time, her religious exercises reached a most extraordinary degree of asceticism. Her prayers were almost continual, and she was reported to be favoured with visions, ecstasies, and other supernatural visitations, of which many curious details are related by her biographers, and in her own letters and papers. The fame of her sanctity spread not only throughout Spain, but into almost every part of the church. By some, the reality of the reported supernatural favours which were ascribed to her was called into question; and there were even some who threatened to invoke the rigorous investigation of the Holy Office; but the popular voice was freely accorded to her, and the authority of St Francis Borgia, St Peter of Alcantara, and other high names, eventually disarmed the opposition. The most notable and permanent fruit of the enthusiastic spirituality of T. is the reform of the Carmelite order, of which she became the instrument. She commenced this work in concert with a few zealous members of her own sisterhood in the convent at Avila, where she had resided from the date of her profession; but after a time, she obtained permission from the Holy See, under the direction of Peter of Alcantara, to remove with her little community to St Joseph's, a small and very humble convent in the same city, where she established in its full rigour the ancient Carmelite rule, as approved by Innocent IV. in 1247, with some additional observances introduced by T. herself. This new convent was established in 1562, and in the end of that year, or the beginning of 1563, T. took up her abode therein; and in 1565, she obtained from the pope, Pius IV., a formal approval for the rule as modified by her. For two years, T. lived in great privacy and quiet in her convent of St Joseph; but in 1567, the general of the Carmelite order, F. Rubeo, was so struck, during his visitation of the convents at Avila, with the condition of that over which T. presided, that he urged upon her the duty of extending throughout the order the reforms thus successfully initiated. T. entered upon the work with great energy, and although she met with much opposition, nevertheless succeeded in carrying out her reforms. In 1579, the Carmelites of the stricter observance established by T. were released from the jurisdiction of the old superiors, and united into a distinct association, with a separate head and a distinct organisation, which was approved in 1580 by Pope Gregory XIII. Under this new constitution, the association flourished and extended; and within the lifetime of T., no fewer than 17 convents of women and 16 of men accepted the reforms which she had originated. T. died at Alba, October 4, 1582, in her 68th year. She was canonised by Gregory XV. in 1621, her feast being fixed on the 15th October. She left a number of works, which have at all times maintained a high reputation among the spiritualists of her own church, and whose merits, in many respects, are acknowledged by non-Catholic writers. They consist of ascetical and mystical treatises, instructions in the conventual life, meditations, &c., besides a large number of letters, which possess remarkable literary merit, quite independent of their doctrinal character. Her works in the original Spanish fill two folio volumes, and they have been in the whole or in part translated into almost every European language. Her life occupies nearly an entire volume of the new continuation of the *Acta Sanctorum*; and several more popular biographies have been written in Spanish, French, Italian, German, and very recently in English by the Rev. Canon Dalton. See also *Leben der heil. Theresia*, von Dr Fr. Pösl (Regensburg, 1847).

TERLI'ZZI, a flourishing, well-built town of Italy, in the province of Bari, 20 miles south-east of Barletta, and 8 miles from the Adriatic. It contains a cathedral, a parish church, and three convents. The almond tree is extensively cultivated in the vicinity. Pop. about 20,000.

TERM, in Legal phrase, has several meanings, but that best known is when it denotes certain days of the year for calculating rent between landlord

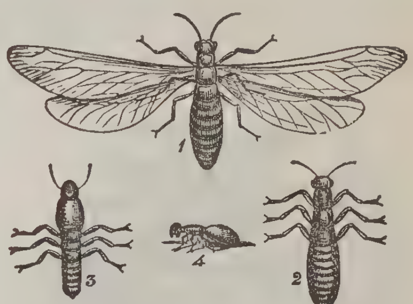
and tenant, and which have been adopted by immemorial usage, owing to the convenience of thus terminating the contract between the parties. In England and Ireland, the year is for this purpose divided into four quarters or terms. These are—Lady-day, March 25; Midsummer-day, June 24; Michaelmas-day, September 25; and Christmas-day, December 25. In Scotland, the terms as between landlord and tenant are divided into legal and conventional terms. There are two terms recognised by common law—viz., Whitsunday, May 15; and Martinmas, November 11; while other two conventional terms subdivide these—viz., Candlemas, February 2; and Lammas, August 1.—There is also a subdivision of the year into Law-terms (q. v.), adopted and sanctioned by statute for the purpose of the sittings of the law-courts. These are Hilary, Easter, Trinity, and Michaelmas terms.—There is a third and technical meaning of the word 'term,' when it means an estate for years in land.

TE'RMINI (anc. *Thermæ Himærenses*), a seaport town on the north coast of Sicily, 21 miles east-south-east of Palermo, at the mouth of the river Termini. It is built partly on a plateau (the summit of which is crowned by a castle—now a prison—of medieval construction), and partly on the slope and in the hollow beneath. T., with its noble background of towering hills, and its magnificent view of the Mediterranean, well deserves the title of *La Splendidissima*, bestowed on it by the Emperor Frederick II. Many of the inhabitants are engaged in fishing for tunny and anchovies. Pop. about 23,000.

The ancient *Thermæ* (of which T. is an Italian corruption) was founded 408 B.C., after the destruction of the Greek city of Himæra, and whence its name Himærenses. Whether it owed its origin to the Carthaginians themselves, or to the surviving citizens of Himæra, is doubtful; but it soon passed under the authority of the former, who here defeated the Romans with heavy loss (260 B.C.) during the first Punic war. After Sicily became a Roman province, Thermæ was treated with peculiar consideration by its new masters, and became a flourishing place. Relics of the ancient city, as the baths (which are still used), fragments of a theatre, and aqueduct, are still visible; and numerous inscriptions, statues, &c., are preserved in public and private collections.—See B. Romano's *Antichità Termitane* (Palermo, 1838).

TE'RMINUS, a Roman divinity, supposed to preside over public and private boundaries. Originally, he appears to have been the same as Jupiter himself, but gradually he was recognised as a separate and distinct god. Hardly any religious conception is more thoroughly characteristic of the Romans, that land-loving, law-reverencing people, than the conception of T., whose worship was practised down to a late period.

TE'RMITE, or WHITE ANT (*Termites*), a genus of insects of the order *Neuroptera*, and of the family *Termitidæ*, or *Termitinæ*. They live in great communities, chiefly in tropical countries, and are almost omnivorous, in the larva, and pupa, as well as in the perfect state. In their communities, there are five classes—males, females, workers, neuters, and soldiers. The workers, neuters, and soldiers seem all to be imperfectly developed females. The males and perfect females have four wings, which are long and nearly equal, and which are often suddenly cast off before the termination of their life; but the greater part of the community consists of workers, which are wingless. The 'soldiers' are larger than the neuters, and have very large mandibles, which they are always ready to use upon any assault. The antennæ of the genus *Termes* are long and thread-shaped, with about 20 joints; the eyes are small and prominent, and there are three *ocelli;* the abdomen has a pair of minute caudal appendages. Most of the white ants make their nests on the ground, but some of them among branches of trees, decayed or dry wood forming a principal article of their food. The species which make their nests on the ground make them conical, or turret-shaped, often 12 feet, and sometimes even 30 feet high, in groups, like a little village. The soil where the white ants have laboured is particularly good, and the South Africans take advantage of its excellent quality. The nest is divided internally into numerous chambers and galleries; there are generally two or three roofs within the dome-shaped interior, and the thick walls are perforated by passages leading to the nurseries and magazines of food. If a breach is made in the building, the soldiers appear, ready for defence. White ants are very useful in consuming every kind of decaying animal or vegetable matter



1 and 2, Perfect Termites; 3, Soldier; 4, Worker.

They even eat grass, and the snapping of multitudinous mandibles has been likened to the sound of a gentle wind among trees. They sometimes attack the wood-work of houses, and soon reduce the thickest timbers to a mere shell. Extraordinary and incredible stories are told of their attacking and devouring large animals, but it seems probable that they do so only when the animals are helpless from age or sickness. They come in vast hosts to any place where food is to be found, and are not easily driven off; multitudes pressing on, although previous multitudes have been destroyed. They gather great stores of corn into their nests, of which the natives of Africa often avail themselves. They are themselves also used as food in Africa, and are said to be delicate and pleasant. The abdomen of the pregnant female T. becomes dilated to an extraordinary degree, so as to exceed the rest of her body 1500 or 2000 times, and she is then about 1000 times heavier than the male insect. Her fecundity is prodigious; she is supposed to lay more than 31,000,000 of eggs in a year.

The Termites which live in trees construct nests of great size, like sugar-casks, of particles of gnawed wood, cemented by a kind of gluten, and so strongly attached to the branches as not to be shaken down even by violent storms. These species sometimes take up their abode in the roofs of houses, where they are very destructive to the wood-work.

Termes mordax and *T. atrox* are among the African ground-building species. *T. lucifugus* is found in the south of Europe, and has proved very destructive in the navy-yard of Rochefort, and elsewhere in the south of France. Sulphurous

gases and chlorine are forced into its galleries, without completely effecting its extirpation. *T. flavicollis* is very injurious to olive trees in Spain. *T. frontalis* extends as far north in the United States as Massachusetts, and does mischief in vineries, not only attacking dead wood, but the roots of living vines. No true species of *Termes* is found in Britain, but some of the *Termitidæ* are British insects. One of them is *Psocus pulsatorius*, one of the insects which emit a sound like the ticking of a watch in houses. The species of the genus *Psocus* are very small, active insects, living beneath the bark of trees, in wood, straw, &c. Some of them are often found among books and in collections of natural history.

In books of travels, the termites are often called ants, their habits being similar, although they belong to a different order of insects.

TERN (*Sterna*), a genus of birds of the Gull family (*Laridæ*), by some made the type of a distinct family (*Sternidæ*); having the bill as long as the head, or longer, nearly straight, compressed, slender, tapering; the wings long and pointed; the tail long and forked. The plumage is very full. From their forked tail, manner of flight, and small size, the terns are often called sea-swallows. They are

Common Tern (*Sterna hirundo*).

incessantly on the wing, skimming the surface of the water, and catching small fishes and other small animals from it. The species are numerous, and are found in almost all parts of the world. Some of them are of very wide geographic distribution. Many are birds of passage. Thus, all which occur on the British coasts, and in other northern parts of the world, are mere summer visitants. The COMMON T. (*S. hirundo*) is abundant on the more southern shores of Britain, but rarer in the north. It is found also on the coasts of Europe, Asia, and Africa, from the Arctic Circle to the farthest south; but there is some doubt if its range extends to America, where a very similar species, WILSON'S T. (*S. Wilsoni*), was long mistaken for it.

TERNA'TÉ. See MOLUCCAS.

TE'RNI (anc. *Interamna*), a town of Central Italy, on the right bank of the Nera (anc. *Nar*), a little below its confluence with the Velino, 49 miles north-north-east of Rome. It is encircled by a wall, with towers and five gates, is well-built, gives name to an archbishopric, and possesses a cathedral, several fine palaces and churches, a hospital, theatre, and various monuments of antiquity, as the ruins of an amphitheatre, temples, and baths—none of which, however, are of much importance. T. manufactures silk and woollen fabrics. Pop. about 10,000. About two miles from the town is the famous cataract of Velino, 500 feet high, celebrated by Byron in his *Childe Harold*.

Ancient *Interamna*, according to classic tradition, was founded only 80 years after Rome, but we have no knowledge of its history until it ceased to be an Umbrian, and became a Roman city. About the time of Marius and Sulla, it was (according to Florus) one of the *florentissima Italiæ municipia*, but at no period did it occupy a very prominent position. Its chief claim to notice arises from its being regarded (by some) as the birthplace of the historian Tacitus, and of his descendant, the emperor of the same name.

TERNSTRŒMIA'CEÆ, a natural order of exogenous plants, allied to *Guttiferæ*, and consisting of trees and shrubs, natives of warm and temperate countries. About 150 species are known. They are most abundant in South America; a few are found in North America; some in India, China, and other parts of the East; only one African species is known; and Europe produces none. The leaves are alternate, leathery, in many species evergreen, generally undivided, sometimes dotted. The flowers are on axillary or terminal stalks, generally white, sometimes pink or red; with 5—7 concave, leathery, deciduous sepals, and 5—9 petals, which are often combined at the base; many hypogynous stamens, which are either free or variously combined; 2—7 filiform styles, more or less combined; the fruit a 2—7-celled capsule, either opening by valves, or leathery and indehiscent, the seeds large, few, and attached to the axis, the cotyledons very large, and often containing much oil. This order is very important as containing the Tea-shrubs. It is also interesting because of the great beauty both of the foliage and flowers of many of the species, of which the genus *Camellia* affords the best-known examples. See TEA, CAMELLIA, and GORDONIA.

TERPSI'CHORÉ (Gr., delighting in the dance), one of the nine Muses (q. v.), presided over choral song and dancing.

Statue of Terpsichore.

TERRACI'NA (anc. *Tarracina*), a town of Italy, in Velletri, formerly a delegation of the Papal States, on the coast at the south-east extremity of the Pontine Marshes, near the mouths of the Ufente and Amaseno. It is the seat of a bishop, possesses a cathedral (built on the ruins of a heathen temple), a square with a handsome fountain, a palace of Pius VI., and, on the summit of a precipice overlooking the town, the ruins of a palace of Theodoric, king of the Goths. The harbour, a naval station of the Romans, is now filled up. Pop. 4600.

Tarracina was originally a Volscian town, and was called by the Volscians *Anxur*, a name which is often applied to it by the Latin poets. It fell into the hands of the Romans 400 B. C., became the seat of a Roman colony 329 B. C., and as long as the Republic and Empire lasted, was a flourishing and important city. So closely do the mountains here approach the sea, that there was scarcely room for the celebrated 'Appian Way;' hence the importance of T. as a military position. Numerous ruins of the ancient town are extant.

TERRA-CO'TTA, an Italian term signifying *baked clay*. It is applied chiefly, if not altogether, to

manufactures of brick-earth used for ornamental purposes, especially those used architecturally. Formerly, it was not uncommon in Britain, particularly about the beginning of the 18th c.; but after the reign of Queen Anne, it was discontinued, and was scarcely ever used until within the last ten years. A complete revival has now taken place, and this material has been applied with admirable effect in some of the buildings lately erected, especially the South Kensington Museum, and the Charing Cross Railway Station Hotel.

TE'RRA DEL FUE'GO, more correctly, Tierra del Fuego (q. v.).

TE'RRA DI LAVO'RO, or CASERTA, a maritime province of Southern Italy, bounded on the N.-W. by the former Papal States. Area, 2500 square miles; pop., according to the census of 1881, 714,487. This is the famous *Campania Felix* of the ancients. Pliny extols its beauty and its fine situation. Florus calls it the finest country in the world. In ancient times, it was inhabited by the Ausonii, the Osci, and later by the Campani. The finest part of Campania has been separated from it, and is that fertile tract of country which surrounds the Gulf of Naples like an amphitheatre; another part has been added to the province of Molise. T. di L. is watered by two rivers, the Liris or Garigliano and the Volturno. Towards the east, it is broken up by the Apennines, and its beautiful ranges of hills are clothed with vine and olive yards, and studded with country-seats. It produces corn, strong wines, oil, fruits, and silk. Its seaport towns are populous and busy, although here and there the sea-board is interrupted by marshes. The climate is very mild in winter, and extremely hot in summer.

TE'RRA DI SIE'NNA. See BURNT SIENNA.

TERRA-FI'RMA, a term frequently employed to denote continental land as distinguished from islands. But it was at one time more specially applied—1st, to all the mainland of Italy which acknowledged the supremacy of Venice—viz., to the duchy of Venice, Venetian Lombardy, the March of Treviso, the duchy of Friuli and Istria; 2d, to that extensive tract of South America, bounded by the Pacific Ocean, Peru, the silvas of the Amazon, the Atlantic Ocean, and the Isthmus of Panama, which mostly belonged to the Spaniards during the last century. In a still more restricted sense, the term was applied by the Spaniards to the Isthmus of Panama itself. Colloquially, the phrase *terra-firma* is applied (but erroneously) to land as distinguished from water.

TERRA JAPO'NICA. See CATECHU.

TERRANO'VA, a seaport town on the south coast of Sicily, province of Caltanisetta, on the right bank of the Omonimo, 18 miles east from Alicata. Pop. about 20,000. There is no regular port, but the town carries on a good trade in fruit, corn, pulse, sulphur, soda, and above all, in cotton, large quantities of which are grown in the vicinity. A kind of coarse cloth is manufactured for home consumption. T. is believed to occupy the site of the ancient Gela (q. v.). The town now standing was built by Frederick II. in the 12th century. In its neighbourhood is the village of Mazarino, from which the famous cardinal took his name.

TE'RRAPIN, the popular name of many species of fresh-water tortoises, of the family *Emydidæ* (see EMYS), natives of tropical and the warmer temperate countries. The neck can be wholly retracted within the shell; the head is flat, and the jaws prolonged into a beak. They feed partly on vegetable food, but also devour fish, reptiles, and other aquatic animals. They swim very well, and even on land move with much greater swiftness than land-tortoises. Their flesh is generally much esteemed.—Very many species are natives of North America.

TERRE HAUTE, a city of Indiana, U. S., on the east bank of the Wabash, 73 miles west-south-west of Indianapolis. The public buildings include the State Normal School, Providence Hospital, industrial school, a fine opera-house, 7 banks, 7 public-school edifices, Roman Catholic convent and schools, 18 churches, &c. It has 3 daily and 5 weekly papers, 2 public libraries, and abundant supplies of bituminous coal. It is the terminus of 6 important railways, connecting it with all the principal cities of the West. Pop. (1860) 8594; (1870) 16,103; (1880) 26,042.

TERRE-PLEIN, in Fortification, is the flat surface of the rampart, on the front portion of which the parapet and banquette are formed, and of which the rear slopes down to the general level of the enclosure.

TERRE'STRIAL MAGNETISM. In the article MAGNETISM, it is shewn that the earth itself is to be considered as a great magnet; and in the present article it is proposed to exhibit the chief results of observation on the earth's magnetism as seen in its action on artificial magnets. That action is simply *directive;* that is, it determines the way in which the magnet shall point, but has no tendency to translate or move it bodily. Terrestrial magnetism acts differently at different places; what are called the *magnetic elements* of a place, are the direction of the needle in regard to the points of the horizon (*variation* or *declination*), its direction in regard to the vertical (*inclination* or *dip*), and the force that keeps it in these positions (*intensity*). For the first two elements, see DECLINATION-NEEDLE and DIPPING-NEEDLE. The element of intensity is more difficult to determine. The relative horizontal intensity is measured by the number of oscillations that a needle, of unit size and strength, when disturbed makes in a given time, the intensities of two places being as the squares of the oscillations. The total intensity is got by dividing the horizontal intensity by the cosine of the angle of dip. Gauss has succeeded in reducing this measurement from a relative to an absolute standard.

Magnetic Charts.—The magnetic elements have been ascertained with great care at different portions of the earth's surface. The knowledge thus obtained has been embodied in magnetic charts, in which the points at which the declination is the same are joined by lines, and similarly those where the dip and intensity are alike. The lines of equal declination are called isogonic lines; those of equal dip, isoclinic; and those of equal intensity, isodynamic lines. As the magnetism of the earth is subject to a slow secular variation, such charts are only true for the time of observation. The chart, fig. 1, was drawn up by Colonel Sabine for the year 1840, and gives an approximate view of the lines of equal declination for that year. The change since 1840 has been small, so that an isogonic chart for the present time would differ but slightly from it. The chart sufficiently explains itself. Attention may however, be given to one or two points. The declination is marked on each line. Thus, the line passing through England, for instance, is marked 25°, and that passing north-west of the British Islands, 30°. At places under those lines, the needle points to a north 25° and 30° west of the true north. On the space intervening between these lines, including Scotland and Ireland, a correction, varying from 0° to 5°, must be made according as the station lies more towards the one line than the other. The westerly line of no declination passing northward

cuts off the eastern corner of South America, proceeds to North America, which it enters at North Carolina, traverses the continent by Lakes Erie and Huron and the west of Hudson's Bay, and ends in the north of the continent at Boothia. The easterly line of no declination passing southward enters Europe in the north of Russia, crosses the White Sea, the east of Russia, of the Caspian Sea, of Persia, and the Arabian Sea; then turns eastward, and cutting off the west of Australia, passes southward. The space included between those two lines, and which in the chart is left untinted, constitutes, so to speak, the hemisphere of westerly declination. It includes the east of the two Americas, the Atlantic Ocean, the whole of Europe and Africa, and the west of Asia and Australia. The rest of the earth, which in the chart is tinted, has an easterly declination. There is an elliptic space in Eastern Asia which is

Fig. 1.

left white, having a westerly variation, and forms an exceptional region in the eastern magnetic hemisphere.

It will be seen that the lines converge in the north of North America, and in the south of Australia. So far as experience goes, and so far as the most matter-of-fact theory (Gauss's) teaches, the convergence in both cases is to a point. The point in North America is the *north magnetic pole*, and that south of Australia is the *south magnetic pole*. At these points, then, all isogonic lines converge, and a compass-needle lies indifferently in any position.

The isogonic lines, as seen from the chart, form a somewhat complicated system. This arises from the fact, that we refer the indications of the needle to the geographical poles, which are, so far as we know, arbitrary or extraneous as regards terrestrial magnetism. Duperrey, by drawing what he calls *magnetic meridians and parallels*, draws a system of lines which have much the same conformation with regard to the magnetic poles that the meridians and parallels of latitude have to the geographical poles. A magnetic meridian, according to Duperrey, is the line that would be described by a person setting out, say from the south magnetic pole, and travelling always in the direction of the magnetic north till he reached the north magnetic pole. The magnetic parallels are lines drawn at right angles to the magnetic meridians.

In fig. 2, the isoclinic lines, by the same author and for the same epoch, are given. In the upper part of the chart, which is left white, the north end of the needle dips; and in the lower part, which is tinted, the south end of the needle dips. The amount of dip is marked on each line. Thus, the line passing through the centre of England is marked 70°. A dipping-needle, at any place cut by the line, is inclined 70° to the horizon. The line 75° passes to the north of the British Isles. In Ireland and Scotland, therefore, the dipping-needle has an inclination greater than 70°, and less than 75°. The line marked 0° is the line of no dip; at any station on it the dipping-needle is horizontal. This line is called the *magnetic equator*. It will be seen that it is not coincident with the geographical equator; it is not even a great circle of the earth, but is an irregular curve cutting the equator in two points, one near the west coast of Africa, and the other in the middle of the Pacific Ocean. The points on the earth's surface where the dipping-needle stands vertical, and where, in consequence, as before mentioned, the compass-needle lies in any direction, are called the magnetic poles. The north magnetic pole was found in Boothia Felix by Captain Ross at 70° 5′ N. lat., and 263° 14′ E. long. According to Gauss's calculation, it should have been at the time (1831) some 3′ north of this point. From observations made at Hobart Town, the nearest station to it, the south magnetic pole should lie 66° S. lat. and 146° E. long. These points are not diametrically opposite each other, as the geographical poles. If the lines of equal dip were drawn on a globe, they would form round the magnetic poles a system of irregular circles, somewhat resembling

that of the parallels of latitude round the poles of the earth.

We do not add an isodynamic chart, as it would take up too much space. Colonel Sabine's Dynamical Chart, along with the isogonic and isoclinic charts, will be found fully engraved and explained in Johnston's *Physical Atlas* (new edition). From this chart we learn that the magnetic intensity is least in the vicinity of the magnetic equator, and increases as we approach the magnetic poles. The lines of equal intensity, though running much in the same direction as the lines of equal dip, are neither coincident nor parallel with them. The line of least intensity, itself not an isodynamic line, runs nearly parallel to the magnetic equator, but lies, except in the western half of the Pacific, a few degrees to the south of it. We thus learn that the changes in direction and intensity do not march together. We should fancy that at that point or points on the earth's surface where the dipping-needle stood erect, we should be nearest to the centre of free magnetic energy, and that there the force would be greatest; but this is not the case. The point in North America where the intensity is greatest, is situated to the west of Hudson's Bay, some 18° south of the north magnetic pole. But this is not the only point of maximum force in the north magnetic hemisphere. There is another, which was found by Hansteen in 1828 in Northern Siberia, about the longitude 120°. This maximum point is weaker than the American in the proportion of 100 to 107 (Sabine). According to Gauss, there can only be one maximum point in the southern hemisphere, which is stronger than either of the other two. It lies north-east of the south magnetic pole, and its intensity is 137 (Gauss) compared with 107, that of the principal northern centre. At none of those points does the dipping-needle stand erect. This want of coincidence of the points of vertical dip and of maximum intensity has led to some confusion in the use of the term magnetic pole; some writers meaning by it a point of vertical dip, and others a point of maximum intensity. In adopting the former definition, we are only adhering to the popular meaning of the word, and to the opinion of Gauss, perhaps the greatest authority on the subject. Some of the best English authorities, however, attach to it the latter meaning.

Although the total intensity increases as we go northward or southward from the line of least intensity, the horizontal intensity diminishes. This arises from the fact, that the greater the dip the less the horizontal intensity. Hence the compass-needle,

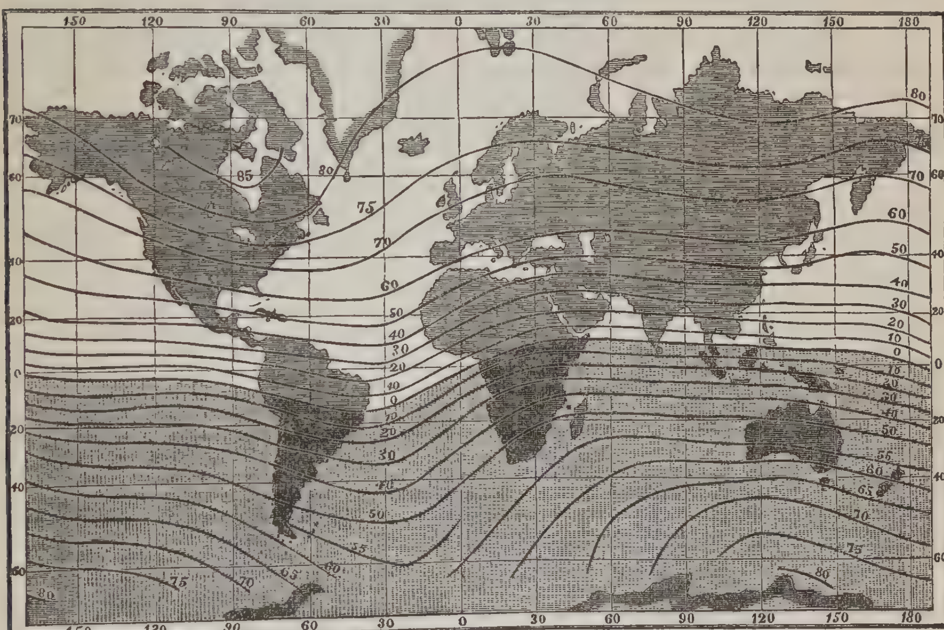


Fig. 2.

which is affected alone by the horizontal intensity, oscillates more sluggishly as we leave the line of least intensity. A dipping-needle, for instance, oscillates faster at London than at Calcutta, because the total intensity which affects it is greater at London than at Calcutta; but with a compass-needle it is the reverse, from the horizontal intensity being greater at the latter than at the former station.

Variations of the Needle.—The magnetic elements do not remain constant in the same place, but are subject to continual though small variations. These are regular and irregular. Under regular variations are included *secular*, *annual*, and *diurnal* variations. The secular variations take centuries for their completion. The following list of the declination and dip at London in different years will give an idea of the secular variations for these elements:

Year.	Declination.
1576, . .	11° 15′ easterly.
1657—1662,	0° 0′ no declination.
1760, .	19° 30′ westerly.
1815, . .	24° 27′ 18″ westerly. Maximum.
1850, .	22° 29′ 30″ westerly.
1865, Jan. 1, at Kew,	21° 6′

Year.	Declination.
1720, . .	74° 42′
1780, .	72° 8′
1800, . .	70° 35′
1830, .	69° 38′
1850, . .	68° 48′
1865, Jan. 1, at Kew,	68° 9′

At present, the annual decrease of declination at Kew is 8′. At this rate it would take rather more than 84 years for the compass-needle to shift through a whole point. From the observations of

the dip, we find that it has been gradually decreasing for the last 150 years. The annual decrease of dip is at present about 2′·6. The time during which observations have been taken of the declination and dip is far from comprehending a cycle of change in either, and it is a mere matter of speculation how long that may take. The magnetic history of London does not apply to other places; each place, so far as has been ascertained, having a magnetic history of its own. Thus, in Paris, the time of no declination was 1669; and of maximum declination, 1814; the latter amounting to 22° 34′ W. Every place, according to Barlow, appears to have its own magnetic pole and equator. Magnetic intensity has been observed for so short a time, that little as yet is known of its secular variation. At present, the horizontal intensity is increasing in Europe, but that may arise partly from decrease of dip.

The magnetic elements are also subject to changes, which have a yearly and a daily period. In describing these shortly, we shall limit ourselves to the changes affecting declination, as these are of most general interest. The following are the chief particulars of the *annual variation* of declination given by Cassini: From April to July, or from the vernal equinox to the summer solstice, the western declination decreases. From the summer solstice to the vernal equinox, that is, during the other nine months of the year, the declination increases, the needle turning to the west. Its position in May and in October is nearly the same; so that in the winter months, from October to April, the westerly motion is slow. The range of the annual variation at Kew is 58″·85.

The mean *diurnal variation* for Kew is shewn in fig. 3. The irregular line indicates the course of the north end of the needle. A rise of this line indicates a change of the north end to the east; a fall, a change to the west. The interval between two horizontal lines corresponds to a deflection of the needle 1′ to the east, and a fall 1′ to the west. The line marked ° is the magnetic meridian, or the mean daily position of the needle. The interval between two upright lines corresponds to an hour. The course begins at twelve at night, and ends at twelve the following night. At twelve at night, the magnet is 1½′ east of the mean position, and continues nearly in the same position, with only a slight westerly deviation, till 15 hours (three in the morning), when it veers eastward. At 20 hours (eight in the morning), it reaches its furthest east point. From eight in the morning till one in the afternoon, it makes a sweep of 10′ towards the west, and then stands about 6′ to the west of the mean. After one, it goes westward till midnight, when it again begins the same course. The needle stands in its mean position a little after ten in the morning, and a little before seven in the evening. The course here described is the course for the year. But the diurnal range is different in different months. In May, for instance, the average range between the extreme points is 12′, which is the maximum range for the year; and in December, when it is a minimum, it is only 5′ 28″. The diurnal changes here described for Kew are much the same all over the north magnetic hemisphere. The amount, however, is different. Near the magnetic equator the diurnal variation is little or nothing, and it increases as we go northward. Captain Duperrey states that at or near the magnetic equator, the north point of the needle in the morning shifts slightly east or west of the mean, according as the sun passes south or north of the station. In the southern magnetic hemisphere, the daily motions of the needle take place much in the same way as in the northern hemisphere, only the south pole takes the place of the north pole, and the direction of the deflections is reversed. The correspondence, and at the same time opposition, of the southern hemisphere is also shewn from the time of maximum and minimum range. When the sun is in the northern signs of the zodiac, the range is a maximum in the northern, and a minimum in the southern hemisphere; and when the sun is in the southern signs, the reverse takes place. The diurnal variation is so small, that the ordinary compass-needle is not delicate enough to shew it.

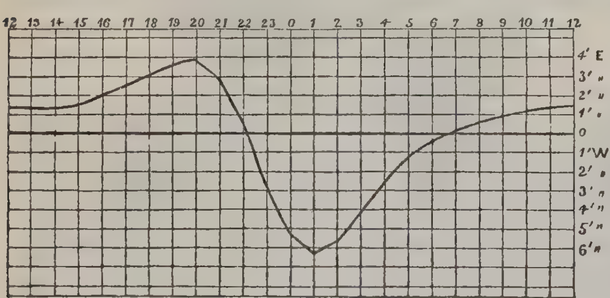


Fig. 3.

The *irregular variations* are those which break in upon the regular march of the diurnal variation, without in the main altering it. Instead, for instance, of the needle steadily going westward from 8 A.M. to 1 P.M., as shewn in fig. 3, it makes, when affected by irregular variation, deflections eastward as well as westward, although it in the main moves westward; so that the line between these hours, instead of being comparatively straight, would be an irregular zigzag. These disturbances of the mean course are sometimes considerable, amounting even to one or two degrees in extreme cases. On some days, the mean diurnal course is much disturbed, on others, very little; but it is never quite free from them. It has been found that places of the same longitude have similar disturbances at the same time; that those on opposite sides of the globe, or differing by 180° of longitude, have disturbances equal in amount, but opposite in direction; and that those situated 90° west or east of the disturbed regions, have little or no disturbance. The appearance of auroras is invariably accompanied by magnetic irregularities, and their effect extends far beyond the regions where they are visible. Earthquakes and volcanic eruptions have also a marked effect in this way. Humboldt gave the name of *Magnetic Storms* to these irregular disturbances. Sabine has found that the frequency of magnetic storms is greatest every ten years, at the same time that the spots on the sun are most numerous.

1. *Theories of Terrestrial Magnetism.*—The earliest theory was that suggested by Gilbert, in which it is supposed that a magnet in the middle of the earth extends from one magnetic pole to the other. On this supposition, the general phenomena of terrestrial magnetism may be accounted for—a needle, both by declination and dip, must point to the poles. This must always remain, from its simplicity, the popular theory on the subject. In consistency with his theory, Gilbert considered the north pole of the magnet to be a south pole, as he

took the north pole of the earth for his standard north pole. If this theory were correct, the magnetic equator would be a great circle of the earth, and the magnetic poles would be 90° from it, which is far from the case. It is only a rough approximation to a just theory.

Halley endeavoured to supplement Gilbert's theory, by supposing two magnets of unequal strength crossing each other at the earth's centre to be the cause of terrestrial magnetism. The theory of the two magnets or four poles was ably defended by Hansteen.

Barlow considered that the earth acted on the needle as if currents of electricity traversed it from east to west. He imitated its action by wrapping a wire in parallel coils round a wooden globe, and causing a galvanic current to pass through it. Each turn of the wire represented a magnetic parallel, and the two ends of the coil the magnetic poles; and to complete the analogy, the globe was movable on an axis, which stood in the same relation to the ends of the coil as the astronomical to the magnetic poles of the earth. When a small needle was placed on the globe, its declination and dip bore a striking resemblance to those of a needle similarly situated on the earth's surface. The objection to this theory is the difficulty of accounting for the origin of such currents in the earth. To meet this, some suppose the earth to be a huge thermo-electric pile; as the heat of the sun falls on one side of it, currents are there generated which travel round the globe. But how, again, it may be asked, are the conditions of thermo-electricity implemented by the materials of the earth? This question still remains to be answered. The close connection between temperature and magnetism is shewn by the diurnal variation of declination, the epochs of which closely correspond with those of the daily temperature, and by the fact, that the isodynamic and isothermal lines manifest a marked correspondence. Sir David Brewster has also shewn that there are two centres of maximum cold in the northern hemisphere, which are situated near to the two intensity poles.

Gauss did not start from any simple supposition of one or two magnets giving rise to the magnetism of the earth, nor did he assert or deny its electric origin. Considering the whole earth as magnetic, he aimed at determining how it must act as a whole at the different points on its surface. In order to make the equations he obtained theoretically in this attempt express the distribution on the earth, the magnetic elements of eight stations at a sufficient distance from each other on the earth's surface had to be ascertained and substituted in these equations. This done, from the longitude and latitude of any station he considered himself prepared to deduce its magnetic elements. The magnetic charts which he sketched, though founded on the imperfect observations to which he had access, are singularly in keeping with fact, and go far to establish the correctness of his reasonings.

The secular variations are as yet wholly unaccounted for. The cause of the diurnal variation is universally attributed to the sun. Secchi, who carefully studied the diurnal variation of the needle, considers that the sun, so far as they are concerned, acts upon the earth as a powerful magnet at a distance.

Historical Sketch.—The discovery of the change in declination at different places is generally attributed to Columbus, and was one of the many important observations of his memorable voyage across the Atlantic. Robert Norman, an instrument-maker in London, first discovered the dip of the needle in 1576. He was led to it by finding that needles nicely balanced before magnetisation had to be slightly loaded on the south end, to keep them horizontal after being magnetised. Gilbert (1600) gave the first theory of terrestrial magnetism, viz., that of the single magnet. Halley, the astronomer-royal, published his theory of the four poles in 1683. In 1688 and 1689, at the expense of government, he made two magnetic voyages, the results of which he embodied in his charts of the lines of equal declination, published in 1701, which were the first magnetic charts ever published. In 1722, the diurnal variation was discovered by Graham, the celebrated instrument-maker of London. The first inclination chart was published by Wilke at Stockholm, 1768. Humboldt inaugurated the present system of careful observations of terrestrial magnetism by taking comparative measurements of the magnetic elements at Peru and Paris (1799—1803). Hansteen's work on the *Magnetism of the Earth* was published at Christiania, 1817; in 1826 he published the first isodynamic charts. Barlow (1831) suggested the electric origin of terrestrial magnetism. In 1831, Captain Ross came upon the north magnetic pole. In 1835, stations were established throughout Europe, and the observations were published by Gauss and Weber, 1836. Gauss (1833—1840) perfected his theory. In 1837, Colonel Sabine published an isodynamic chart of the whole globe. Observations were made (1840—1854) at stations throughout the British Empire by British officers, under the direction of Colonel Sabine.

TERRESTRIAL TEMPERATURE. The distribution of heat over the globe is represented by isothermal lines, or lines drawn through all places having the same mean temperature. The mean annual temperature is shewn by the lines in fig. 1, and the warmest and coldest months in fig. 2, the dotted lines shewing the mean temperature for January, and the solid lines the temperature for July.

The part of the globe having the highest mean annual temperature forms an irregularly shaped belt, lying along the equator, and comprised between the north and the south isothermals of 80°. On either side of this warm belt the temperature diminishes towards the poles; and the lines shewing successively this diminution are, speaking in a very loose sense, arranged parallel to the equator, thus shewing the all-predominating influence of the sun as the source of terrestrial heat. The coldest portion of the earth's surface is a small oval-shaped patch near to but not surrounding the north pole, its mean temperature being −4°. Its narrowest diameter lies north and south, nearly touching the pole on the one side, and extending on the other as far south as 72°·30 N. lat. in 130° W. long. Part of it is seen in the diagram. On looking at the isothermal of 0°, one might be led to suppose that there are two centres of greatest cold, one north of Siberia, and the other north of British America. Such, however, is not the case—the apparent double centre of greatest cold being solely due to the isothermals being drawn on Mercator's projection of the earth; for if an isothermal map be drawn on a polar projection, the lines of mean annual temperature enclose one connected space of greatest cold, and not two such spaces, as is not unfrequently stated.

While the decrease of temperature in advancing towards the poles corresponds in a general way to what may be called the solar climate, there are deviations brought about by disturbing causes too important to be overlooked. These disturbing causes are (1) the currents of the sea; (2) the prevailing winds; and (3) large surfaces of water which are frozen during part of the year.

The influence of an oceanic current depends on

the temperature of the place it leaves and the place at which it arrives. Hence the great equatorial current, flowing from east to west, does not require to be considered here, because the heat remains the same throughout its course; but only those currents which convey the waters of the sea to higher or to lower latitudes. Of these, the most marked and important is the Gulf Stream in the North Atlantic, which, by conveying warm water to the arctic regions, pushes the isothermals many degrees to the northward. There is a similar, though much feebler, current passing from the North Pacific to the Arctic Sea through Behring's Strait, and there, accordingly, the isothermals are pushed a little to the northward. In the southern hemisphere, there are two currents, one discovered by Humboldt, passing from the Antarctic Ocean northward by the coast of Peru as far as Lima; the other flowing from the Cape of Good Hope northward along the west coast of Africa: these currents, flowing from colder to warmer latitudes, lower the temperature, and thus drive the isothermals towards the equator. Again, the great equatorial current, after impinging on the east coast of Africa, turns southward, and by the warmth it imparts, pushes the isothermals into higher latitudes. For the same reason, the current flowing southward past the coast of Brazil, raises the temperature in the east of that country. The influence of these great currents is more distinctly marked in the forms of the isothermals for January and July. Thus, in January, when the relative excess of the temperature of the Gulf Stream is greatest, the isothermals are driven very far to the north; and similarly in the southern hemisphere, the currents from the Antarctic Ocean being coldest in July, the isothermals are deflected more towards the equator during that month. The most remarkable lowering of the isothermals occurs in Labrador

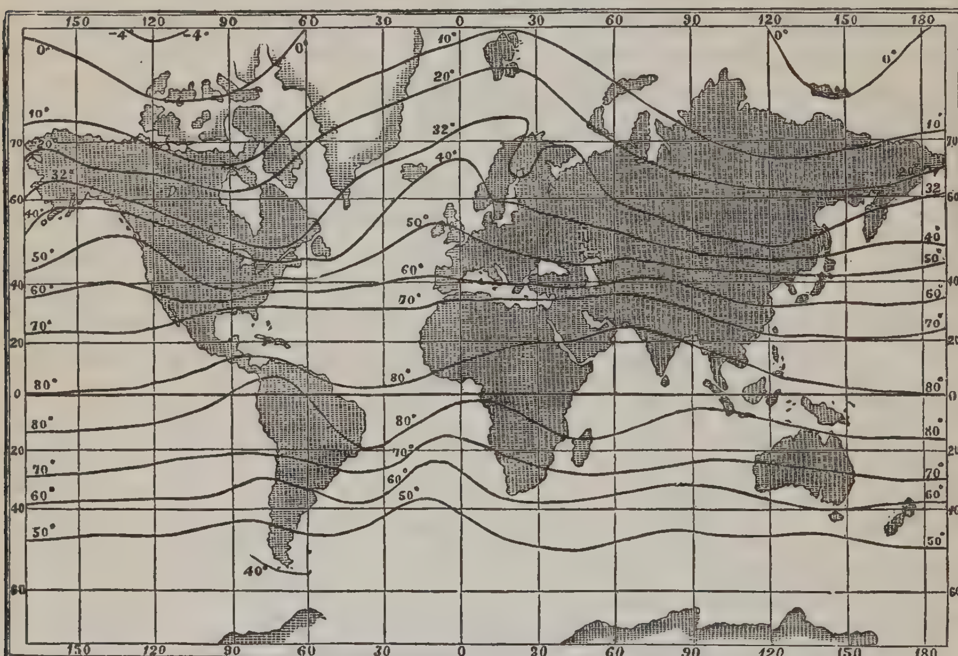


Fig. 1.

and Newfoundland during May and June, and is caused by the icebergs which then descend on these coasts from Davis' Strait.

Since winds bring with them the temperature of the regions they have crossed, the equatorial current is a warm wind, and the polar a cold wind; also winds arriving from the ocean are not subject to such variation of temperature during the year as winds from a continent. As an atmosphere loaded with vapour obstructs both solar and nocturnal radiation, it follows that moist winds are accompanied with a warm temperature in winter, and a cool temperature in summer; and dry winds with cold winters and hot summers. The direction of mountain-ranges is also an important element to be taken into account in estimating the influence of winds on temperature. These considerations explain the position of the isothermals in the north temperate zone, where the prevailing wind is the south-west or anti-trade (see WINDS). In January, the western parts of each continent enjoy a comparatively high temperature, from their proximity to the ocean, whose high temperature the winds waft thither; and they are further protected from extreme cold by their moist atmosphere and clouded skies. But in the interior of the continents it is otherwise; for the winds getting colder as they advance, and being deprived of their moisture as they cross the mountains in the west, the soil is exposed to the full effects of radiation during the long winter nights, and as a consequence, the temperature rapidly falls. In the centre of Siberia, the January temperature falls to $-40°$, which is $9°$ colder than the coldest part of the American continent; and this centre of greatest cold lies near the eastern part of the continent of Asia. On the other hand, in July, the interior of continents is much warmer than their western parts. Hence the interior and eastern parts of Asia and America are characterised by extreme climates, and the western parts by equable climates. Thus, at Yakutsk, in Siberia, the July temperature is $62°·2$, and the January $-43°·8$, the difference

being 106°·0; whilst at Dublin these are respectively 60°·8 and 38°·5, the difference being only 22°·3. This constitutes the most important distinction of climates, both as respects vegetable and animal life. On man especially the effect is very great—the severity of the strain of extreme climates on his system being shewn by the rapidly-increasing death-rate as the difference between the July and January temperature increases.

The great fresh-water lakes of North America—Lakes Superior, Huron, Erie, Michigan, Ontario, Bear Lake, &c.—exercise an important influence on

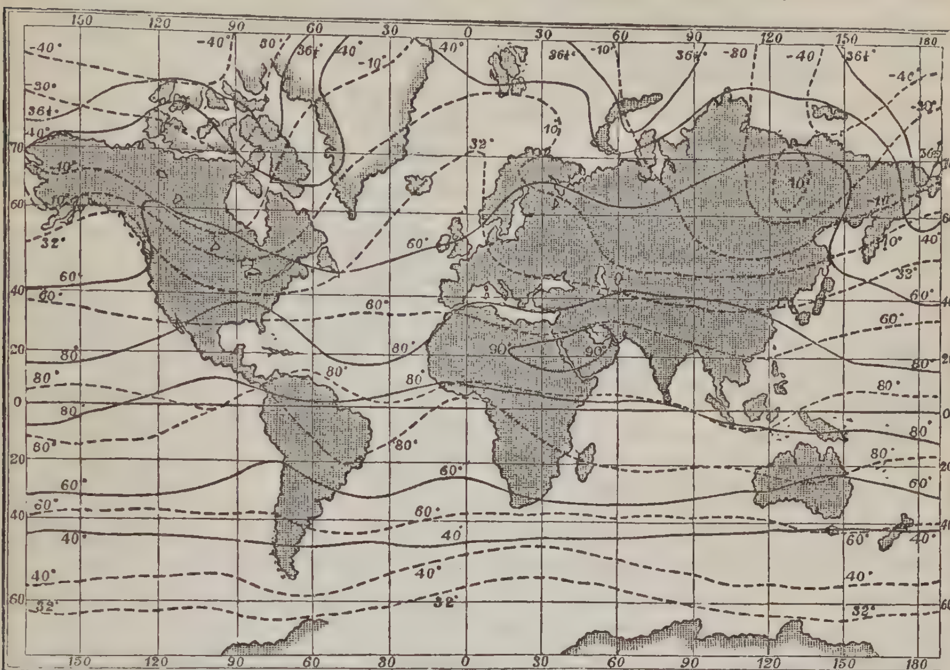


Fig. 2.

the climate of the central parts of North America, for in winter, America, with its frozen lakes, is a truly unbroken continental mass, and its winter climate is therefore continental; whereas in summer its numerous large sheets of fresh water communicate to it many of the features of an insular summer climate.

The whole effect of the disturbing causes is seen at once, if we compare the observed temperature of a place with its normal temperature, that is, the temperature due to it in respect of its latitude. In the northern hemisphere, in January, the sea and the western parts of the continents are in excess of their normal temperature; elsewhere, there is a deficiency. There are two centres of excess, one to the north-east of Iceland, amounting to 41°; the other in Russian America, amounting only to 18°; and two centres where the temperature is deficient, one at Irkutsk, amounting to 41°; and the other west of Hudson's Bay, amounting to 27°. In July, the United States, Europe, Asia, the Indian Ocean, the north of Africa, and the extreme north of South America, have their temperature in excess, while elsewhere it is deficient. The centres of excess are, north of Siberia, 13°·5; Red Sea, 11°·0; and north-west of the United States, 4°·5: and the centres where the temperature is deficient are, the entrance to Hudson's Bay, 11°·0; and the Aleutian Islands, 11°·0.

TE'RRIER, a small kind of dog, remarkable for sagacity, vivacity, courage, and eagerness in the pursuit of 'vermin,' which it readily follows into burrows; whence apparently the name T., from Lat. *terra*, the earth. The courage of the T., however, is such that it will readily attack animals much larger than itself; and it has been observed in India that terriers will fearlessly rush at the largest carnivora, when even the bull-dog hesitates. Terriers are of great use for killing

Scotch and English Terriers.

rats in places much infested by them. They are also used for compelling the fox to leave his retreat; and a large variety called the *Saufinder*—that is, Boar-seeker—is employed in Germany to rouse the fiercest beasts of the forest from their

lairs. The varieties of T. are numerous. In Britain, two are particularly prevalent, known as Scotch and English terriers—the former with long, rough, wiry hair, with which even the face is much covered; the latter with smooth, short hair. The ears are either erect and pointed, or have pendent tips. The Skye T. is a breed of Scotch T., peculiarly prized. If any kind of dog may be regarded as truly indigenous in Britain, it is the T.; but there is no certainty that it was not imported by the first inhabitants. Dogs very similar have existed in the north of Europe in a domesticated state from remote antiquity. The BULL T. is probably a cross between the T. and the Bull-dog (q. v.).

TERSCHELLING, one of the chain of islands to the north of Holland, lies in 53° 24′ N. lat., the principal villages being Oosterschelling, Westerschelling, and Midsland. It consists of fertile arable and meadow lands, is protected on the south by large dykes, and in other parts by downs, which are carefully preserved. Area about 45 sq. miles. Pop. 3128. There is a good haven, a shipbuilding-yard, a woollen dyework, &c. The old church of the hamlet of Stroe (Strū) is supposed to be a former heathen temple. T. was the birthplace of William Barentz, the celebrated Arctic explorer. See NORTH-EAST PASSAGE.

TE'RTIAN FEVER. See AGUE.

TE'RTIARY (Lat. *Tertiarius*, one of the third rank), a name given by church writers to a class in the Roman Catholic Church, who, without entering into the seclusion of a monastery, aspire to practise in ordinary life all the substantial obligations of the scheme of virtue supposed to be laid down in the Gospel. Whatever earlier traces of this institution may be observable, there is no dispute that it was under St Francis and the mendicant orders generally that the institute of T. reached its full development. The rules of the institution of T., such as they have since substantially been maintained, were made public in 1221. The associates must, of course, all be members of the church; and it is moreover required that all shall be of good repute and blameless life. The intending members must restore all ill-gotten goods, must renounce all evil practices, and abandon all feuds and enmities with their neighbours. Wives cannot be received without the consent of their husbands. The obligation of T. once accepted, is irrevocable, unless the party should be released, or should enter into a more strict religious order. The members are required to renounce luxury of life, profane exercises and amusements, costly or unseemly dress, and the use of arms, except in the necessity of self-defence. They must frequent the sacraments; hear mass, if possible, daily; observe the fasts of the church, as well as certain special austerities; avoid contention, litigation, and unnecessary oaths; cultivate charity towards all, with special obligations towards needy, sick, or afflicted brethren, and practise with more than common fervour the great Christian virtues. The T. are placed under the authority of superiors elected at intervals, and for a stated period, and are liable to an annual visitation, conducted by a priest appointed for the purpose. It is to be observed, however, that none of these obligations were supposed to bind the members under pain of mortal sin.

Such was the celebrated institute of the T., or the Third Order of St Francis. Similar lay associations were organised in connection with the Dominican, Carmelite, and Augustinian, as well as with certain of the more modern orders; and a brotherhood of the same character had already been formed by the Templars. It ought to be added, that the T. institute, properly so called, is quite distinct from that of the lay 'confraternities' which exist in connection with the several orders, and the objects of which are very similar.

TERTIARY, the term applied in the science of Geology (q. v.) to all the strata of the earth's crust above the Cretaceous Rocks, with the exception of those superficial beds which have recently been raised to a distinct group, under the title of the Quaternary System, or Recent Period. There is considerable difference of opinion as to the division-line between the two systems, some including the boulder-clay and its associated beds in the one, and some in the other group. Tertiary is synonymous with Cainozoic, and is divided into the Pleiocene (q. v.), Meiocene (q. v.), and Eocene (q. v.) periods.

TERTU'LLIAN, a Father of the church, and one of the earliest who used the Latin language in written compositions. In one passage, the genuineness of which there is no reason to doubt, he calls himself Septimius Tertullianus. The best manuscripts call him Quintus Septimius Florens Tertullianus. He was the son of a proconsular centurion—that is, a centurion who attended on the proconsul. He was born in Carthage. He was brought up a heathen, and from his own writings we learn that he was licentious in his conduct, and fond of the public shows. We know nothing more of his heathen life. Eusebius describes him as a man exceedingly well acquainted with the laws of the Romans, and his writings bear out the assertion. From this circumstance, some have identified him with a Tertullianus whose name occurs in the index of the Pandects, and have supposed that he acted as an advocate; but the supposition is a mere conjecture. We know nothing of his conversion. He became a presbyter in the church, but whether he held this office in Rome or in Carthage, is matter of dispute, and there are no data to determine the question. It is certain that he visited Rome, and was well acquainted with the affairs of the Roman Church. He also married; and as his wife was a Christian, it is supposed that his marriage took place after his conversion. After remaining a presbyter until he had reached middle age, he became a Montanist. Jerome attributes his adoption of Montanism to the insulting treatment which he received at the hands of the Roman clergy. But this is not likely an entirely accurate account of the matter. Jerome himself had been ill treated by the Roman clergy, and was therefore inclined to blame them; and in the character and general tendency of T.'s opinions, we have ample explanation of his passing over to Montanism. See MONTANUS. He lived to a good old age, remaining a Montanist to the last. We have no clue to precise dates in the history of Tertullian. Jerome states that he flourished under Severus and Antoninus Caracalla. Allix places his birth at 145 or 150 A.D., and his death at about 220 A.D.; but these are conjectures.

T. was a man of strong and violent passions: he loved and hated with intensity. He possessed considerable culture, and was well versed in Roman law, in ancient philosophy, history, and poetry. He was not deficient in philosophical power, but he was narrow, bigoted, and uncharitable. He shews no sympathy with Greek speculation or with freedom of human thought; and he shews little sympathy with the joys and pleasures of man, being strongly inclined to asceticism. We need not wonder, therefore, that he came to believe in the Paraclete of Montanus as the revealer of the perfection of Christianity, and that he adopted the

Montanist opinions, that second marriages were adulteries, and that it was unlawful to flee in times of persecution, and wrong to receive the lapsed back into the communion of the church.

His writings are numerous. Attempts have been made to divide them into those which were written before he became a Montanist, and those written after that event; but the attempts have failed; for in treating many subjects he would have no occasion to say a word in regard to the Paraclete, second marriages, or persecution.

His works are interesting, throwing much light on the internal circumstances of the church, on the social questions which perplexed Christians, on the opinions of heretics, and on the development of doctrine. Of his theology, Neander remarks: 'In Tertullian we find the first germ of that spirit which afterwards appeared with more refinement and purity in Augustine, as from Augustine the scholastic theology proceeded, and in him also the Reformation found its point of connection.' Among the peculiar opinions which he held, may be mentioned his belief in the corporeality of the human soul.

His writings had great influence on the subsequent ages, but especially on Cyprian. Jerome says: 'I saw at Concordia, in Italy, an old man named Paulus. He said that, when young, he had met at Rome with an aged amanuensis of the blessed Cyprian, who told him that Cyprian never passed a day without reading some portion of Tertullian's works; and used frequently to say: *Give me my master*, meaning Tertullian.'

There are many editions of Tertullian; the best is by Franciscus Oehler (3 vols. 8vo, Lps. 1853). The third volume contains the principal dissertations on the life and writings of Tertullian. The works of T., with many dissertations and notes, form the first and second volumes of Migne's *Patrologia Latina*. The English reader will find a full and satisfactory account of T.'s life, writings, and opinions in Bishop Kaye's *Ecclesiastical History of the Second and Third Centuries, Illustrated from the Writings of Tertullian* (8vo, 2d ed., Cambridge, 1829); and in Neander's *Anti-gnosticus, or the Spirit of Tertullian*, translated by J. E. Ryland, and appended to his translation of Neander's *History of the Planting and Training of the Christian Church* (2 vols. 8vo, Lond. 1851).

TE'SCHEN, a town of Austrian Silesia, on the right bank of the Olsa, 38 miles east-south-east of Troppau. Pop. 8000. Here, in 1779, a treaty of peace was concluded between Maria-Theresa and Frederick II., by which the dispute of the Bavarian Succession was brought to an end.

TE'SSERÆ, the small square tiles or cut stones used in forming tesselated pavements.

TEST ACTS, otherwise called *Corporation Acts*, the popular name given to two English statutes imposing certain oaths on the holders of public offices. Act 13 Car. II. c. 2, directs that all magistrates shall take the oaths of allegiance and supremacy, as well as an oath renouncing the doctrine that it is lawful to take arms against the king, and provides that they must receive the communion according to the rites of the Church of England within a year before their election. Act 25 Car. II. c. 1, imposed the like conditions on the holders of all public offices, civil and military, and obliged them in addition to abjure all belief in the doctrine of transubstantiation. These acts, which were practically evaded to a large extent by means of an act of indemnity passed every year, were repealed 9 Geo. IV. c. 17, in so far as regarded the administration of the sacrament, for which a declaration set forth in that act was substituted. A statute of William IV. substituted a declaration for an oath in most government offices. A new form of oath has been substituted for the oaths of supremacy, allegiance, and abjuration by 21 and 22 Vict. c. 48.

TE'STAMENT. See BIBLE.

TESTAMENT. See WILL.

TESTA'TUM is one of the clauses of an English deed, otherwise called the Witnessing or Operative part, commencing at the words, 'Now this indenture witnesseth that,' &c.; and it includes a statement of the consideration-money and the receipt thereof.

TESTER, or **TESTOON**, a flat canopy over a tomb, pulpit, &c.

TE'STICLES. See REPRODUCTION.

TESTIMO'NIUM, in an English deed, otherwise called the Attestation Clause, is that part which states that the party signed the deed, beginning with the words, 'In witness whereof.'

TESTING, in Chemistry, embraces a series of processes, the details of which would occupy far more space than the general plan of this work would admit of. Indeed, testing may be regarded as equivalent to qualitative analysis. As a simple illustration of the process of testing, we will assume that the most common of all chemical compounds, a salt, is submitted for examination. The student must pursue some such course as the following: 1. He must examine the dry substance before the blow-pipe, and note whether (*a*) it is volatile, as are the salts of ammonia and mercury; or (*b*) fusible, as are the salts of potash and soda; or (*c*) infusible, as are the salts of zinc, alumina, magnesia, lime, strontia, and baryta; or (*d*) reducible, as are the salts of silver, tin, lead, bismuth, antimony, and cadmium; and (*e*) whether it gives a coloration to the borax bead, and what that colour is. 2. Having made his blow-pipe examination, he must bring his substance to a finely-divided state, and dissolve it, if possible, in water, and if it is insoluble in that fluid, even with the aid of heat, in hydrochloric or nitric acid. The solution, whether in water or acid, to which no test or reagent has been applied, is termed by Odling (*A Course of Practical Chemistry*, 2d ed., 1865) and others *the original solution;* and to this are added various tests, such as sulphuretted hydrogen, hydrosulphate of ammonia, ammonia, nitrate of silver, &c. The most common effect resulting from the addition of a gaseous or liquid reagent is to cause a *precipitate* or solid deposit of either the base or acid sought for. These precipitates differ in their colour, consistency, &c.; and the student must note not only the colour of the precipitate (although this is the most important point), but also whether the deposit is crystalline, gelatinous, clotty, &c. 3. He must then ascertain to which group the base he is seeking for belongs. There are three great groups of bases; the members of the first group being precipitated from their acid or acidified solutions by sulphuretted hydrogen (hydrosulphuric acid); those of the second group not being thrown down by this reagent, but being precipitated from neutral solutions by hydrosulphate of ammonia (sulphide of ammonium); while those of the third group are not thrown down by either of these reagents. The first group includes tin, arsenic, antimony, bismuth, mercury, lead, silver, copper, and cadmium; the second, nickel, cobalt, manganese, iron, chromium, aluminium, and zinc; and the third, barium, strontium, calcium, magnesium, potassium, sodium, and ammonia. (See Odling, *op. cit.*, p. 64.) 4. Having ascertained to which base the group belongs, the next point is to identify it. For information on this point, the

reader is referred to any of the standard works on qualitative analysis, or on practical chemistry. 5. The base being thus determined, it remains to determine the acid, and in searching for it, the student will be much assisted by a knowledge of the solubility of the most important classes of salts. Knowing, for example, the insolubility of the sulphates of baryta and strontia, he need not search for sulphuric acid in a soluble salt of one of these earths. On the other hand, a salt insoluble in water is not likely to be a nitrate or chlorate, or acetate, or chloride (the only chlorides insoluble in water being chloride of silver and calomel). We cannot enter into the testing for acids further than to observe that the nitrates and chlorates deflagrate; the tartrates and citrates char; the carbonates effervesce when acted on by an acid more energetic than carbonic acid; the silicates, borates, and benzoates are precipitated by hydrochloric acid; and the arseniates and chromates react with hydrosulphuric acid. The presence of any particular acid is more or less indicated by its behaviour, while still in union with the base, with strong sulphuric acid, which in many cases causes the evolution of characteristic fumes or vapours; and amongst the tests especially applicable for the detection of the acids (in acid solutions) are solutions of nitrate of baryta, nitrate of silver, chloride of calcium, and perchloride of iron. As the above remarks apply merely to the detection of the base and acid contained in a single salt, it will readily be understood how much the difficulties are increased when there is a mixture of several salts, or where, in place of a metallic oxide, a vegetable base is present, or where we have to deal with a complicated mixture of organic and inorganic substances, as, for example, in the investigation of the contents of the stomach in a case of suspected poisoning.—The following works on the subject may be referred to: Fresenius's *Qualitative Analysis*, Noad's *Qualitative Analysis*, Greville Williams's *Outlines of Chemical Manipulation*, Bowman's *Practical Chemistry*, and Odling's *Practical Chemistry*.

TESTING CLAUSE, in a Scotch deed, is the last clause, which narrates when and where the parties signed the deed, before what witnesses, the number of pages of which the deed consists, and who was the person who penned the deed. Moreover, if there have been any interlineations or erasures of important words during the engrossing, these should be mentioned in this clause. The clause is an essential part of a Scotch deed, and no deed which is written by another than the party is valid unless the testing clause is regular. The usual form is this: 'In witness whereof, these presents, written on this and the five preceding pages by John Smith, residing at, &c., were subscribed by the parties as follows—viz., by the said A. B. at Glasgow on the 10th day of October 1865, before these witnesses, W. X. of, &c., and Y. Z. of, &c.'—In English or Irish deeds, there is no necessity to enumerate these particulars in the attestation clause.

TEST-PAPERS are made by dipping unsized paper into an alcoholic solution of a vegetable colouring matter which changes colour when exposed to the action of an acid or alkaline solution. The paper, after being gently dried, is cut into slips of a suitable size. Hence, by dipping the appropriate test-papers into any solution, we can ascertain whether it is acid, alkaline, or neutral. Litmus and turmeric are most commonly used as the colouring matters; litmus for the detection of acids, and turmeric for that of alkalies.

TESTU'DO. See TORTOISE.

TESTUDO, in Ancient Warfare, was a defensive arrangement of the shields, by means of which a body of men advancing against a wall for assault or mining sought to protect themselves from the darts and weapons of the defenders. The men standing in close order joined their shields above their heads, the edges overlapping, until the whole resembled the shell of a tortoise (*testudo*).—The name was also applied to a machine moving on wheels, and roofed over, under which soldiers worked in undermining or otherwise destroying the walls in a siege. See BATTERING-RAM.

TE'TANUS (derived from the Gr. *teinein*, to stretch) is one of the most formidable diseases of the nervous system, and is characterised by an involuntary, persistent, intense, and painful contraction or cramp (see SPASM) of more or less extensive groups of the voluntary muscles, nearly the whole of the body being sometimes affected. There is usually a certain degree of order in which the different sets of muscles are affected. The muscles of the neck, jaws, and throat are almost always the first to give evidence of the presence of the disease. 'The patient,' says Dr Watson, who has written a most graphic description of this terrible malady, 'feels a difficulty and uneasiness in bending or turning his head, and supposes that he has got what is called a stiff neck. He finds also that he is unable to open his mouth with the customary facility. At length the jaws close; sometimes gradually, but with great firmness; sometimes (it is said) suddenly and with a snap. In four cases, perhaps, out of five, the disease begins in this way with *trismus* or *lock-jaw;* so that this last is the vulgar name for the complaint. Along with this symptom, or very soon after it, the muscles concerned in swallowing become affected; and in a short time there comes on, what is often the most distressing part of the disorder, an acute pain at the lower part of the sternum, piercing through to the back. This pain depends, it can scarcely be doubted, upon cramp of the diaphragm, and is subject to aggravation in paroxysms. The spasm extends to the muscles of the *trunk;* to the *large* muscles of the extremities; the muscles of the *face;* and last of all, in general to the muscles of the tongue, and of the hands and fingers, which often remain movable at the will of the patient, after all the other voluntary muscles of the body have become fixed.'—*Lectures on the Principles and Practice of Physic*, 4th ed., vol i. p. 568. The muscles that are affected remain permanently contracted till either recovery or death ensues, and some of them, as, for example, the muscles of the abdomen, are so rigid, as when struck by the fingers, to resemble a board, although a perfect remission of the spasm scarcely ever occurs, except sometimes during sleep. Exacerbations of the spasms, on the other hand, commonly occur every ten minutes or quarter of an hour, usually beginning by an increase of the pain at the sternum, and lasting for two or three minutes: and as the disease advances, these paroxysms become more frequent. The powerful muscles of the back generally overcome the muscles in the front of the body, and when this excess of morbid power in the back is marked, the result is that the patient during the paroxysms rests solely on his head and heels, while his body is raised in an arched form. Occasionally the muscular contraction predominates in the opposite direction, and brings the head and knees in contact; and still more rarely, the body is bent to one side.

During the exacerbations, the face of the patient often presents a positively frightful appearance. The tongue is apt to get bitten during the contractions, which are occasionally so violent as to break the teeth, rupture powerful muscles, and at least in one

case, to fracture the thigh-bone. Death usually results from a mixture of causes, but mainly from apnœa (breathlessness), due to the fixed condition of the respiratory muscles, associated with asthenia (loss of power), and flagging of the heart's action.

There are two principal causes of this disease, viz. (1) exposure to cold and damp, and (2) bodily injuries. When tetanus arises from the *first* of these causes, it is termed *idiopathic;* and when from the second, *traumatic.* Idiopathic tetanus is so rare, at all events in this country, that we may pass on at once to the consideration of the traumatic variety. The disease is liable to follow any kind of injury, from a trifling cut or scratch to a compound fracture or the most severe operation, and is much more common in tropical than in temperate climates. The following table, given by Mr Poland in his article 'Tetanus' in Holmes's *System of Surgery,* vol. i. p. 306, gives the relative proportions which the occurrence of tetanus bears to various classes of surgical lesions observed at Guy's Hospital during seven years:

There were of—		
Major and minor operations,	1364 cases—tetanus occurred in	1
Wounds of all varieties, .	594 " " "	9
Injuries and contusions, .	856 " " "	1
Burns and scalds, . .	458 " " "	3
Compound fractures, . .	396 " " "	9
Total, . .	3668	23

From the large experience thus afforded, it appears that tetanus is most frequently met with in the more severe varieties of injury and accident, such as compound fractures, burns, and injuries to the fingers and toes. It is still a disputed point, whether the seat of the injury forms any special connection with the disease. Hennen, one of our greatest authorities on military surgery, observed it oftener after wounds of the elbow and knee; others, again, more frequently from injuries of the thumb and great toe. There is certainly a popular belief that wounds of the ball of the thumb are especially likely to be followed by tetanus.

The interval between the reception of the injury and the first tetanic symptoms commonly varies from the 4th to the 14th day, and rarely exceeds 22 days, some time in the second week being the most common period. As a general rule, the more rapidly the disease comes on, the more fatal will be the result.

Mere *trismus* or lock-jaw may be induced by affections of the teeth, especially by difficult dentition of the wisdom-teeth; but this is a purely local affection, in which the muscular contraction, though persistent, is never increased by painful spasmodic paroxysms, and which usually disappears on the removal of the exciting cause; and the general knowledge of this fact may tend to remove unnecessary terrors. Hysteria sometimes mimics the phenomena of tetanus with marvellous fidelity; and hydrophobia and tetanus have been mistaken for one another, in consequence of the spasm of tetanus sometimes affecting the muscles of deglutition, and inducing a fear of swallowing. There is, however, seldom any serious difficulty in detecting the difference between tetanus and any other disease. But there is a form of poisoning which produces almost every symptom of tetanus, and which may be termed *artificial tetanus.* If strychnia or brucia, or their salts, or vegetable matter containing either or both of these alkaloids, as nux vomica, St Ignatius's beans, or the juice of the upas tiente, be administered, either by the stomach or by inoculation, into the system, it induces all the symptoms of intense tetanus, and there is no test by which to distinguish the results of the disease and of the poisoning, except that, according to Dr Christison, the disease never proves so quickly fatal as the rapid cases of poisoning with strychnia. See NUX VOMICA. And those who wish to study more minutely the comparative symptoms of strychnia-poisoning and tetanus, may consult the authorised *Report of Palmer's Trial.*

In the way of treatment, almost every known medicine has been prescribed, and whatever plan be adopted, a vast majority of the cases terminate fatally. As is the case with certain fevers, so tetanus seems to have a definite course to run; and as Mr Poland wisely suggests: 'All we can do is to enable our patient to weather out the storm by giving him as much strength as possible, and not adding fuel to the fire by all sorts of applications and internal remedies, which have over and over again signally failed. If we can help our patient on one day after another, we gain much: constant watching and constant attention are required by night as well as by day; an unflinching perseverance on the part of the sufferer in carrying out these views; besides the avoidance of all causes of excitement, and more especially the cold air or winds; taking care to preserve a uniform temperature as much as possible.' When, in consequence of the strong contraction of the muscles of the jaw, it is impossible to open the patient's mouth, food and physic should be introduced into the stomach by means of a flexible tube passed through one of the nostrils.

The peculiar form of tetanus that occurs in newly-born children, differs in so many respects from the disease described in this article, that we shall briefly notice it in a separate article under the title of TRISMUS NASCENTIUM.

TETANUS, or LOCK-JAW, occurs in most of the domesticated animals, but most frequently in horses and sheep. It is usually produced by cold and wet, by intestinal worms, obstinate constipation, or injuries. The symptoms usually come on gradually, involve tolerably equally most of the muscular structures, which become hard and rigid; the nose is protruded, the limbs move stiffly, the tail is upraised, the bowels are constipated. The patient must be kept perfectly quiet, and in an airy but tolerably warm place, and plentifully supplied with cold water, and with soft, sloppy, but tolerably nutritive food, which he will usually greedily suck in through his firmly-closed teeth. A full dose of purgative medicine must at once be given; extract of belladonna repeated twice or thrice daily, is occasionally serviceable; any discoverable wound or injury should be fomented or poulticed; bleeding, sedatives, and all causes of irritation must be avoided. In adult animals, most cases are fatal; but amongst young animals, especially when the attack results from exposure to cold, many recoveries occur.

TÊTE-DU-PONT. See BRIDGE-HEAD.

TETRAGONIA'CEÆ, a natural order of exogenous plants, formerly included in *Mesembryaceæ* (q. v.), from which it differs chiefly in the want of petals. The species are herbaceous plants or small shrubs, with alternate, thick, succulent leaves. A few are found on the shores of the Mediterranean, and some in Asia and the South Sea Islands, but the order abounds chiefly in the south of Africa. New Zealand Spinach (q. v.) belongs to this order. Other species are also used like spinach, as *Sesuvium portulacastrum* and *S. repens* in the West Indies. Species of *Aizoon* are among the plants burned for barilla in Spain and the Canary Isles.

TETRAHE'DRON (Gr. *tettares,* four, *hedra,* a side), one of the five regular geometric solids, is a solid bounded by four equilateral triangles. The

best idea of it is gained by considering it as a triangular pyramid, whose three sides and base are equilateral (and therefore equal) triangles. It is a form assumed by some crystals, and in crystallography is considered as a secondary form of the Octahedron (q. v.), produced by removing the alternate angles or edges of the latter.

TE'TRAO AND TETRAO'NIDÆ. See GROUSE.

TE'TRARCH (Gr. *tetrarches*, Lat. *tetrarcha*, 'governor of the fourth part,' i. e., of a country), a title originally designating what is signified by its etymology, the governor of one of four divisions of a kingdom or country; but in the usage of the later Roman Empire, given undistinguishingly to all minor rulers, especially in the east, possessing sovereign rights within their territory, but dependent on the emperor, and in many cases removable at his pleasure. This was especially the case in Syria, where the princes of the family of Herod are called indiscriminately by this title (Luke iii. 1) and by that of king (Matt. xiv. 9). The tetrarch in this latter sense was in truth a sovereign, although a dependent sovereign; and there are even some instances in which it seems to have been applied to really independent sovereigns, when the principality was small and of little importance.

TE'TRA-STYLE, a portico of four columns.

TETUA'N, a seaport town and small province on the north coast of Africa, 22 miles south of Ceuta, and 40 miles south of Gibraltar. Area, 914 sq. m.; pop. 17,600. It is surrounded by walls, flanked with towers, and is defended by a castle. Its harbour does not admit large vessels; but a brisk trade is carried on in wool, silk, girdles, leather, cotton, &c., and it exports provisions largely to Ceuta. Oranges are grown in great abundance in the vicinity, and are exported to Spain, Gibraltar, Oran, and recently to England. T. was taken by the Spaniards under O'Donnell (q. v.), February 1860; and the treaty of Madrid, by which the city was evacuated in favour of the Spaniards, was concluded October 30, 1861.

TETZEL, or TEZEL (properly *Diez* or *Diezel*), JOHN, well known in connection with the controversy regarding indulgences, out of which the first beginnings of the Reformation took their rise, was born at Leipzig between 1450 and 1460. His father was a goldsmith of that city. T., after completing the ordinary studies of the period in the university, entered the Dominican convent of St Paul in 1489, and soon established a reputation as a popular and effective preacher. His personal character is a subject of much controversy. The questions as to the teaching of T. are more important. His ability and success as a preacher led to his being intrusted with the charge of preaching an indulgence, first on behalf of the Teutonic Knights, and afterwards, in 1516, on the far more momentous occasion of the celebrated indulgence published in favour of contributors to the fund for building the church of St Peter's at Rome. In the discharge of this commission, it cannot be doubted that T. went to extremes which it is impossible to justify; but the worst charges, and especially that of preaching the efficacy of indulgences without repentance, and of offering anticipatory pardons for future sin, are strongly denied by Roman Catholic writers as being contradicted not only by contemporary authorities, but also by the very instructions contained in his official commission. Much of the obloquy which he drew upon his cause was produced by the pomp and apparent luxury in which he travelled about upon his mission. It was in opposition to the preaching of T. that Martin Luther published his celebrated theses, on the 31st October 1517. T. replied first by publicly burning these obnoxious propositions; but he afterwards published a series of counter-theses (which were burned in retaliation by the students of the university of Wittenberg); and in May 1518, a detailed reply to Luther's celebrated Sermon on Indulgences. On the arrival of the papal delegate Miltitz, T. addressed to him a letter in reply to the charges of his adversaries; but notwithstanding this defence of his conduct, he was summoned to appear before Miltitz in Leipzig in the January of the following year, and underwent a severe rebuke for the excesses in language, and the improprieties in proceeding, which had brought so much scandal upon the church. Miltitz threatened him, moreover, with the severest animadversions on the part of the pope. He was required in consequence to withdraw to his convent at Leipzig, where he died in the August of the same year, 1519, according to some of the plague, but according to another account, of the chagrin and mortification resulting from the judgment of the papal representative.—See on the one side, Hechlein, *Vita Tezelie;* Hofmann, *Lebensbeschreibung des Ablass-predigers Dr Joh. Tetzel* (Leip. 1844); and on the other, Schrödl, in Wetzer's *Kirchen-Lexicon*, art. 'Tetzel,' x. 767.

TEUTOBURGER WALD (Lat. *Teutobergiensis Saltus*). See HERMANN.

TEUTO'NIC, a term applied to a group of nations, as well as of languages, forming an important division or stem of the Aryan (q. v.) family. The T. languages will be found enumerated and classified in the table at the end of the article PHILOLOGY. The T. stock of nations, as they exist at the present day, is divided into two principal branches: (1) The Scandinavian, embracing Danes, Swedes, Norwegians, Icelanders; and (2) the Germanic, which includes, besides the German-speaking inhabitants of Germany proper (see GERMANY) and Switzerland (q. v.), also the population of the Netherlands (the Dutch), the Flemings of Belgium, and the descendants of the Anglo-Saxons in Great Britain, together with their offspring in North America, Australia, and other British colonies. It is necessary in this case, as in all similar cases, to guard against making language the sole test of race. In many parts of Germany where German now prevails, Slavic dialects were spoken down to recent times, and in some places are not yet quite extinct. And in Great Britain, it is unreasonable to suppose that the Anglo-Saxon invaders exterminated the native Celtic population, or even drove more than a tithe of them into the Highlands. The mass undoubtedly remained as subject serfs, learned the language and customs of their masters, and gradually amalgamated with them; so that, in point of blood, the English are perhaps as much Celtic as Teutonic.

Of the various tribes and nations spoken of as inhabiting Northern Europe in ancient times, it is often difficult to determine which were really of Germanic race, and which Celtic or Slavic; the classic writers having no skill in detecting the affinities of language, had only confused notions of ethnology. Of undoubted German nations who took part in the destruction of the Roman Empire, the most prominent were the Goths (q. v.), Lombards (q. v.), Vandals (q. v.), and Franks (q. v.). The term Teutonic is derived from *Teutones*, the name of a nation or tribe first mentioned by Pytheas, who wrote about 320 B.C., as then inhabiting a part of the Cimbric Chersonesus, or Jutland. For the next 200 years there is no further mention of the Teutones, that is, not until 113 B.C., when they appear in history as ravaging Gaul, and in conjunction with

the Cimbri and Ambrones, threatening the very existence of the Roman republic. The Cimbri having gone into Spain, the Teutones and Ambrones were at length defeated by C. Marius in a great battle at Aquæ Sextiæ, or Aix, in Gaul, 102 B.C., in which from 100,000 to 200,000 of the invading army were slain, and many thousands made prisoners. A similar victory was gained by Marius in the following year over the Cimbri in the plains of Lombardy. It is disputed among ethnologists and historians whether the Cimbri so defeated were of the Celtic or of the Germanic race, and doubts have even been thrown on the claim of the Teutones to be considered Germans, although the best German scholars hold the claim to be established. Be that as it may, Roman writers, after the time of Cæsar and Tacitus, began to use the adjective Teutonicus as equivalent to Germanicus; and this practice was adopted in the middle ages by Germans writing in Latin. The native term was *theodisk*, from Goth. *thiud*, people; and it is from this word and not from Teutonic, that the modern *Deutsch* is derived. See GERMANY.

TEUTONIC KNIGHTS, one of the more celebrated of the military and religious orders to which the Crusades gave birth. The sufferings of the Christian soldiers at the siege of Acre excited the sympathy of certain merchants of Bremen and Lübeck, who rendered such important services by the erection of hospitals and otherwise, that Duke Frederick of Swabia, with the sanction of Pope Clement III. and the Emperor Henry VI., enrolled them in an order of knighthood, as the Teutonic Knights of St Mary of Jerusalem. Only Germans of noble birth were made admissible to the order, the original founders having probably been ennobled before being enrolled. The members were at first all laymen, but priests were soon admitted as chaplains; and there was also added about 1221, a class of half-brothers similar to the serving-brothers of the Templars and Hospitallers. The habit of the order was a white mantle with a black cross; and the knights took vows of poverty and chastity, which in later times were not very strictly interpreted. Their first seat was Acre. On the overthrow of the kingdom of Jerusalem, the grand master removed to Venice, and from thence in 1309 to Marienburg, on the banks of the Vistula. In 1237, this order became united with the Brethren of the Sword in Livonia. In the course of the 13th c., the Teutonic Knights were, with the sanction of the pope, engaged in a bloody war to enforce Christianity on the heathen nations inhabiting the southern shores of the Baltic, which resulted in the acquisition by the order of Prussia, Livonia, Courland, and other adjoining territories. Warriors from all parts of Europe in that and the following century joined their standard, including Henry IV. of England, accompanied by 300 attendant knights and men-at-arms. The conquests of the order raised it to the rank of a sovereign power, with a territory extending from the Oder to the Baltic, and embracing a population of between two and three millions, the grand master having his seat at Marienburg in Prussia. The decline of the order began in the 15th c., and its fall was brought about partly by internal dissensions, and partly by the attacks of neighbouring states. Sigismund of Poland wrested West Prussia from the knights; and Albert of Brandenburg, who was chosen grand master in hopes of his aiding the order against Poland, ended an unsuccessful war with Sigismund by an arrangement, according to which the territories of the order in East Prussia were formed into a duchy, to be held by Albert and his successors. Mergentheim in Swabia then became the seat of the grand master, who was recognised as a spiritual prince of the empire. At the peace of Presburg in 1805, the Emperor of Austria obtained the rights and revenues of the grand master; but in 1809 the order was abolished by Napoleon, its lands passing to the sovereigns in whose dominions they lay. The Teutonic order, however, still continues to preserve a titular existence in Austria.

TEW'KESBURY, an ancient market-town and parliamentary and municipal borough of Gloucestershire, in the vale of Evesham, on the Avon, and near its confluence with the Severn, 10 miles north east of Gloucester. The parish church, an ancient and noble edifice in Norman, is the most noteworthy architectural feature. Hosiery, shoes, nails, leather, and malt are manufactured, and there is an extensive carrying-trade, of which T. is the centre, on the Avon and Severn; pop. about 5000. T., a very ancient town, appears to be of Saxon origin. Within half a mile of it was fought (May 14, 1471) the famous battle of T., in which the Yorkists under Edward IV. (q. v.) and Richard III. (q. v.) inflicted a signal defeat on the Lancastrians.

TE'XAS, one of the south-western of the U. S. of America, is bounded on the S.-W. by Mexico, from which it is separated by the Rio Grande; and on the E. by Arkansas and Louisiana. Area, 237,504 sq. m. Pop. (1860) 601,039, of whom the entire coloured population — 186,682 — were slaves; (1880) 1,591,749. It is divided into 161 counties. Among the chief towns are Austin, the capital; Galveston, the principal seaport; the German town of New Braunfels, Houston, Marshall, Indianola, Corpus Christi, &c. Nearly the whole gulf-coast is lined with bays, generally long and narrow, with shallow inlets—that of Galveston being 12 feet. The chief rivers are the Red River, which separates Texas from the Indian territory; the Sabine, Trinity, Colorado, and Rio Grande. These rivers, mostly navigable from 300 to 400 miles, run south-east, nearly parallel to each other, and empty into the Gulf of Mexico. The country on the coast of the gulf is level, with a gradual ascent, the middle region undulating with rolling prairies; the west is a high table-land, and the salt plains and staked plains (*el llano estacado*) on the border of N. Mexico, are deserts 3000 to 4000 feet above the sea, without trees, and in the summer without grass. There are a few small mountains in the west—spurs of the Rocky Mountains. The river-bottoms are well timbered. In Eastern T., wooded lands, called cross-timbers, alternate with prairies, and the country has a park-like and delightful aspect. The coast-region is formed of alluvial beds of sand or gravel; the middle, of outcrops of tertiary formations. In some places, petroleum is found on the surface of acid springs, and the earth is so charged with bitumen as to be used for fuel. There are fertilising marls and gypsums, brown coal or lignite in beds of six inches to eight feet, and beds of hematite. Beyond the tertiary lies a wide range of cretaceous formations, beds of limestone, sandstone, clays, marls, and beyond these, 5000 sq. m. of coal-measures, four distinct seams, of eight or nine feet in all, resting on fire-clay. There are also fine marbles, and some deposits of lead and copper. The soil is of great fertility, the coast producing the finest cotton, sugar, &c.; and the interior, wheat, Indian corn, tobacco, fruits of all kinds, with abundant pasturage—making it one of the finest cattle-countries in the world. The climate is pure, temperate, and remarkably salubrious. The thermometer ranges from an average of 81° F., the hottest week in summer, to 29°, the coldest week in winter. The eastern region is rainy; the middle, moderate; the south-western, dry. The vegetation

is in the greatest variety, from the oak, cedar, and pine, to the palmetto, mezquit, and nopal, which feeds the cochineal insect, with figs, oranges, grapes, vanilla, and flowers in wonderful profusion. The prairies abound in buffalo, immense herds of wild horses, and the forest with deer. There are also the puma, jaguar, black bear, wolf, &c. The coasts, bays, and rivers abound in the finest fish, shell-fish, turtles, &c. Though the country is generally level, it is not destitute of wild and grand scenery. In some places are found gigantic animal fossils and silicified trees. In 1870, there were 2,964,836 acres under cultivation, producing 20,554,538 bushels of corn, 415,112 bushels of wheat, 762,663 of oats, &c. The total value of the live stock was $37,425,194. The chief manufactures are salt, iron, and woollen goods. There is a large trade with Mexico and with New Orleans. The chief exports are cotton, sugar, tobacco, cattle, and wool. The state Deaf and Dumb, Orphan, Blind, and Lunatic Asylums have each an endowment of 100,000 acres of state lands. There is a state school-fund of $2,575,000, and the income of the educational institutions of all classes for 1870 was $414,880. The assessed value of property for the same year was $149,732,929. In 1873 there were 1232 miles of railroad completed and in operation in the state of Texas.

La Salle, the French explorer, erected a fort on Matagorda Bay, 1687. A Spanish settlement and mission was formed in 1690, but soon abandoned. In 1715, the country was settled by the Spaniards, under the name of New Philippines, and several missions established; but the Comanche and Apache Indians, among the most warlike in America, and still the terror of the border settlements, hindered the progress of the country. In 1803, when Louisiana was ceded by France to the U. S., T., claimed by both Spain and the U. S., became a disputed territory. From 1806 to 1816, settlements were formed, and several attempts made to wrest the country from Spain. In one of these, in 1813, 2500 Americans and Mexicans were killed, and 700 inhabitants of San Antonio. Mina, a Spanish refugee, gained some successes, but was defeated and shot. Lafitte, a Gulf pirate, made a settlement at Galveston in 1815, but it was broken up in 1821. In 1819, the river Sabine was established as the boundary. In 1820, Moses Austin, an American, got a large grant of lands in T. from the Mexican government, and began a settlement, which rapidly increased; but many of the settlers were of so lawless a character, that in 1830, the government forbade any more Americans coming into Texas. In 1833, a convention of settlers, now 20,000 in number, made an unsuccessful attempt to form an independent Mexican state; and in 1835 a provisional government was formed, Sam Houston (q. v.) chosen commander-in-chief, and the Mexicans driven out of Texas. Santa Anna, President of Mexico, invaded the country with an army of 7500, but, after some successes, was entirely routed at San Jacinto, April 21; and T. became an independent republic, acknowledged in 1837 by the United States, and in 1840 by England, France, and Belgium. In December 1845, T. was annexed to the United States, but was invaded by Mexico, which had never acknowledged its independence. A war followed, in which Mexico was defeated. In February 1861, T. joined the Secession, and furnished many soldiers and immense supplies to the Confederate armies. In February 1866, the ordinance of Secession was annulled, and in 1870 the reconstruction was completed, and regular civil government restored.

TEXEL, The, an island in the province of North Holland, separated from the Helder by a narrow strait, called the Marsdiep, contains about 35,000 acres of arable and pasture lands, and has a population of 6408. Many sheep are kept, producing fine wool. Fishing, ship-building, grinding corn, &c., are also sources of prosperity. There is much wealth in the island, but still (1871) no steamboat communication exists with the mainland. The northern part is called Eijerland, or the egg-country, immense flocks of birds coming thither from Scandinavia to deposit their eggs.

TE'XTILE FABRICS. See Weaving.

TEZCU'CO (i. e., 'place of detention'), an ancient and much decayed city of Mexico, stands on the east shore of the lake of the same name in the state, and 16 miles east-north-east of the city of Mexico. In former times, it was the capital of a great state, and was the second city in Mexico. During the early part of the 15th c., the city rose to its greatest splendour. It then contained ranges of stately mansions, in which the nobles resided, and a magnificent and vast pile of buildings, which served as the royal residence and as public offices. T. is now a poor place, filled with heaps of rubbish and ruins, and containing only 5000 inhabitants.

THACKERAY, William Makepeace, novelist and satirist, was born at Calcutta in 1811. He was of a good old English family, represented about the middle of last century by Dr Thackeray, an eminent scholar, and head-master of Harrow. His father was in the civil service of the East India Company, and dying young, he left his son a fortune of £20,000. The latter, when a boy of seven years of age, was sent to England, and placed in the Charterhouse School, that ancient Carthusian foundation, which he loved to commemorate in his writings. He next went to Cambridge, but left the university without taking a degree. In 1831 he was at Weimar, and saw Goethe. His ambition was to become an artist, and he travelled over most of Europe, studying at Paris and Rome. His drawings were not without merit; they were quaint, picturesque, and truthful, but somehow they missed the bright touches of a master-hand. He next took to literature, beginning with rare patience and contentment at the lowest step of the ladder. Under the characteristic name of Michael Angelo Titmarsh, or that of Fitz-Boodle, he became a constant contributor to *Fraser's Magazine*, and wrote for it two of the best of his minor works, *The Great Hoggarty Diamond*, and *Barry Lyndon*. The latter is the story of an Irish sharper, and is told with a spirit, variety of adventure, and humour worthy of Le Sage or Fielding. Under the pseudonym of Titmarsh, he also published *The Paris Sketch-book* (2 vols. 1840), *The Second Funeral of Napoleon, and Chronicle of the Drum* (1841), and the *Irish Sketch-book* (2 vols., 1843). The greater part of T.'s fortune having been spent in foreign travel and unsuccessful speculations at home, he continued to work steadily at literature as a profession. He was never widely popular, but a few good judges appreciated his keen wit, observation, and irony, and his command of a style singularly pure, clear, and unexaggerated. The establishment of *Punch* afforded a more congenial field for T., and his *Snob Papers* and *Jeames's Diary* were hailed with delight by all readers. Their author's reputation was still more advanced by his novel of *Vanity Fair* (1846—1848), published in monthly parts in the style of *Pickwick*, and illustrated by the novelist himself, or, as he expressed it, 'illuminated with the author's own candles.' During the progress of *Vanity Fair* appeared *Notes of a Journey from Cornhill to Grand Cairo*, being an account of a journey undertaken for the benefit of his health; also *Mrs Perkins's Ball*, a short Christmas tale, and two works of a similar kind entitled *Our Street*, and *Doctor Birch and his Young Friends*. In 1849, he began a second serial fiction, *Pendennis*.

in which much of his own history and experiences are recorded. Next followed *Rebecca and Rowena* (1850), and *The Kickleburys on the Rhine* (1851). The latter work was sharply criticised by the *Times*, and T. replied in a caustic and humorous *Essay on Thunder and Small Beer*, prefixed to a second edition of the satirical sketch. In 1851, the indefatigable novelist delivered a course of lectures on the *English Humorists of the Eighteenth Century*—light, graceful, discriminating sketches, with passages of real power and eloquence. In 1852—1855, appeared two more novels, the most richly imaginative and highly finished of his works, *Esmond* and *The Newcomes*. These were followed by *The Virginians* (a much inferior novel), by *Lectures on the Four Georges* (first delivered in America), by *Lovel the Widower* and *Philip* (two short tales of somewhat coarse texture), and by a series of pleasant gossiping essays, entitled *Roundabout Papers*. These originally appeared in the *Cornhill Magazine*, of which T. was for a time editor; and in the same miscellany he had begun and published part of a new novel, *Dennis Duval*, which promised to be one of the most carefully elaborated and successful of his works of fiction. He contemplated also *Memoirs of the Reign of Queen Anne*, which would have served as a continuation to Macaulay's *History*. He knew that period well, from his previous studies for *Esmond*, and as a moral anatomist and master of English he stood unrivalled. But, alas! such dreams and anticipations were suddenly dispelled. To the grief of all lovers of genius and of manly and noble character, T. was cut off in the fulness of his powers in his 52d year, dying alone and unseen in his chamber before daybreak on the morning of the 24th of December 1863. His medical attendants found that death was caused by effusion on the brain, and that his brain was one of the largest, weighing no less than 58½ ounces.

In his delineation of the character and genius of Fielding, T. has drawn his own. He had the same hatred of all meanness, cant, and knavery, the same large sympathy, relish of life, thoughtful humour, keen insight, delicate irony, and wit. There was, however, one personal difference: Fielding was utterly careless as to censure of his works, whereas his successor was tremblingly alive to criticism, and was wounded to the quick by the slightest attack. His morbidly delicate organisation made him exquisitely susceptible of either pain or pleasure. He had suffered much from physical maladies and from domestic calamity; and his earlier works, especially his *Vanity Fair*, were tinged with a degree of cynicism which seemed to countenance the charge of his unfriendly critics, that he delighted in representing the baser side of human nature, and was sceptical as to the existence of real virtue in the world. His strength lay in portraying character rather than inventing incidents; and in Becky Sharp, Colonel Newcome, Harry Foker, Laura Pendennis, and Paul de Koch, to say nothing of the picaroon, Barry Lyndon, he has left us a living gallery, certainly not surpassed by any modern novelist. In his later writings, the dark shades no longer preponderate. The mellowing influence of years and sickness, and calmer as well as more extensive observation of life, had sunk the merciless satirist in the genial humorist and philosophic observer. He had still ample scorn for falsehood and vice, and satire for folly and pretence; but he had also smiles and tears, and tenderness and charity, that gave a moral beauty and interest to the last decade of his brilliant career as an author.

THA'IS, an Athenian courtesan, famous for her wit and beauty, who was in Asia along with Alexander the Great, and according to Cleitarchus—a doubtful authority—induced the Macedonian king, when excited with wine, to set fire to the palace of the Persian kings at Persepolis. After his death, she lived with Ptolemy Lagi, by whom she became the mother of several children.

THALASSIDRO'MA. See PETREL.

THALBERG, SIGISMUND, a very eminent living pianist, who was born at Genéva in 1812, but received the greater part of his musical education at Vienna, where he was a pupil of Hummel. He made his first public appearance in 1827, and his *début* in Paris in 1835. After residing for a number of years in America, he lately returned to Europe. In graceful and brilliant execution, and still more in manual dexterity on that instrument, he has hardly a rival. His compositions are principally fantasias and variations.

THALEI'A, or THALIA (Gr. the blooming one), one of the nine Muses (q. v.), generally regarded as presiding over comedy. By Apollo, T. became the mother of the Corybantes.

THA'LÉS, an early Greek philosopher, founder of the Ionic or physical school of philosophy, and one of the Seven Wise Men (q. v.), was a native of Miletus, in Asia Minor, and flourished towards the close of the 7th c. B.C. Very little is known regarding his life. He is said to have recommended the Ionians, who were menaced by the Persians, to form a federation against their powerful enemy, and to select Teos as the capital. At a later period, we are told he induced the Milesians to withdraw from a union with Crœsus against Cyrus. He is also said to have predicted the eclipse of the sun which happened in the reign of Alyattes. His claim to the title of sage (as in the case of his compeers) was due to his practical wisdom rather than to his speculative achievements. Nevertheless, T. has a name in the history of speculative philosophy. He is even regarded by some as the *first* Greek that speculated on the constitution of the universe. According to him, the original principle of all things is water, from which everything proceeds, and into which it is again resolved. It would appear also that in connection with this doctrine he had some idea of a soul or force in water productive of all the phenomena we see, but it is impossible to ascertain the extent of his belief in an immaterial power. Most probably, his philosophy was a form of Pantheism, rather than of Theism. None of T.'s speculations were committed to writing, and it is only from the notices of later Greeks, such as Herodotus, Aristotle, &c., that we can gather an idea of the character of his thinking.—See Ritter's *Geschichte der Ionischen Philosophie* (Berl. 1821), Lewes's *Biographical History of Philosophy*, and Prof. Ch. A. Brandis, in Smith's *Dic. of Gr. and Rom. Biog.*, art. 'Thales.'

THA'LLIUM (symb. Tl, equiv. 204, spec. grav. 11·9) is a metal which derives its name from the Greek word *thallos*, green, because its existence was first recognised by an intense green line appearing in the spectrum of a flame in which T. is volatilised. It was discovered by Mr Crookes, the editor of the *Chemical News*, in 1861, in the seleniferous deposit of a lead chamber of a sulphuric acid factory in the Harz Mountains, where iron pyrites is employed for the production of the acid. In the following year, it was obtained in larger quantities from a similar source by M. Lamy, who exhibited magnificent specimens of it in solid bars at the last Great Exhibition in London. T. is slightly heavier than lead—a metal which it resembles in its physical properties. It is very soft, being readily cut with a knife, or drawn into wire; and its freshly-cut surface exhibits a brilliant metallic lustre and grayish colour, somewhat between those of silver and lead. In contact with the air, it tarnishes more rapidly than lead, and becomes coated with a thin layer of

oxide, which preserves the rest of the metal. It fuses below a red heat, and is soluble in the ordinary mineral acids. With oxygen, it enters into two combinations —viz., *Protoxide of Thallium*, which is a strong base, forming well-defined salts with acids; and *Thallic Oxide*, which is soluble in water, may be obtained in crystals, and forms soluble salts with the alkalies.

There is a difference of opinion as to whether the salts of T. are or are not powerful irritant poisons. Lamy (with the view of testing the statement of Paulet, that the salts are poisonous) dissolved 75 grains of the sulphate in milk; and he found that this quantity sufficed to destroy two hens, six ducks, two puppies, and a middle-sized bitch. In one experiment, a grain and a half proved fatal to a puppy. Mr Crookes, on the other hand, although much exposed to the fumes of this metal, suffered no particular effects from them; and he swallowed a grain or two of the salts without injury. He found that the latter have a local action on the hair and skin, staining the former, and rendering the latter yellow and horny.—For further details regarding this metal, the reader may consult Mr Crookes's Memoirs in the *Philosophical Transactions* for 1862, and in the *Chemical News*, and Lamy's Memoir in the *Annales de Chimie et de Physique* for 1863.

THALLO'GENOUS PLANTS are those acotyledonous plants which exhibit the greatest simplicity of structure, consisting of a mere Thallus (q. v.) with reproductive organs. Of this description are *Algæ*, *Characeæ*, *Fungi*, and *Lichens*. When apparent leaves exist in any of these, they do not exhibit the symmetry always found in true leaves; and although some of them have stems or stalks, which attain, as in some sea-weeds, both to a considerable age and to great strength, all is composed of cellular tissue without any proper woody fibre.—In the botanical system of Lindley, the T. P. form a class, under the name *Thallogens;* and in that of Endlicher, a corresponding place is assigned to them under the name *Thallophyta.*

THALLUS, in Botany, a structure composed of

Vertical Section of Thallus of *Parmelia parietina*, shewing spores, &c.

Copied from Lindsay's *British Lichens* (London: Routledge).

cellular tissue, without woody fibre, which in some of the lower cryptogamic orders, as *Algæ*, *Fungi*, and *Lichens*, constitutes the whole plant, except the reproductive organs, which are situated in or upon it. The T. assumes very various forms, sometimes crust-like, sometimes spread out like a leaf, simple, lobed, or branched; or, as in mushrooms, it becomes a stalk, cap, and gills.

THAMES (Lat. Tham-*esis*, the 'broad Isis;' *isis* being identical with *esk*, *ex*, *ouse*, &c., all from Cel *uisg*, water), the most important river of Great Britain, and the longest in England, flows east-south-east across the south portion of the country, extending almost from sea to sea. Its remotest springs—those of the upper waters of the Churn—rise on the south-east slope of the Cotswold Hills, 3 miles south of Cheltenham, and 7 miles west of the Severn at Gloucester. The springs unite about a mile from their sources, and form the Churn, which flows south-east 20 miles to Cricklade, and there receives the T., which joins it from the west after a course of 10 miles. The T., or Isis, then flows east-north-east for about 35 miles, when, curving south-east, it passes Oxford, and flows on to Reading, where, after receiving the Kennet from the west, it again changes its course; and with a generally eastward course, it passes Windsor, Eton, Richmond, London, Woolwich, and Gravesend, a few miles below which it expands into a wide estuary, and enters the North Sea. The length of the T. is estimated at 250 miles, the area of its basin at upwards of 6000 sq. miles. Throughout the greater part of its course, it is of importance as forming the boundary-line between several of the southern counties. Passing Cricklade, it forms part of the northern boundary of Wilts, and below this point it separates the counties of Oxford, Buckingham, Middlesex, and Essex on the north from those of Berks, Surrey, and Kent on the south, except certain outlying bits of some of these counties. Its chief affluents are the Coln, Leach, Windrush, Cherwell, Thame, Colne, Lea, and Roding, on the left; and the Kennet, Loddon, Darent, Mole, and Medway, on the right bank. At Vauxhall Bridge, the width of the river is about 230 yards; at London Bridge, 290 yards; at Woolwich, 490 yards; at Gravesend Pier, 800 yards; three miles below Gravesend, 1290 yards; and at its mouth, between Whitstable and Foulness Point, about 8 miles below the Nore, it is 18 miles across. At the Nore Light, the commonly reputed mouth of the T., the breadth is 6 miles. The river is navigable for barges to Lechlade, upwards of 200 miles above its mouth, and it is connected with the Thames and Severn, Oxford, Wilts and Berks, Grand Junction, and several other important canals, by means of which it maintains free communication with the west and south coasts, and with all parts of the interior of the country. Vessels of 800 tons can reach St Katharine's Docks, while those of 1400 tons can ascend to Blackwall, 6 miles below London Bridge. The part of the river immediately below London Bridge is called the *Pool;* and the part between the Bridge and Blackwall is called the *Port.* Two embankments have recently been formed, one on the north shore from Blackfriars Bridge to Westminster, and one on the south shore from Westminster Bridge to Vauxhall. See LONDON.

THANA'TICI is the term used by the Registrar-general, Dr William Farr, in his *Nosology*, to indicate 'lesions from violence tending to sudden death.' These lesions are the direct results of physical or chemical forces, acting either by the will of the sufferer or of other persons, or accidentally.

THANE, or THEGN (A.-S. *thenien*, analogous to Ger. *dienen*, to serve), a title whose use in the early

feudal ages has been the subject of much discussion. In England, in Saxon times, the king's thane was a 'miles emeritus,' who, on the cessation of his actual service about the king's person, received a benefice or grant of land. The term 'miles,' when used by Bede, is uniformly rendered 'cyninges thegn' by his Saxon translator. In the 10th c., all who would, in the feudal era, have been known as tenants *in capite*, were thanes. After the Conquest, thanes and barons are classed together; and in Henry I.'s time, the terms seem to be used synonymously. The office or dignity appears to have been attached to particular estates; thane lands are frequently mentioned in Domesday. After the reign of Henry II., the term fell into disuse. The title thane was introduced at a later period into the northern parts of Scotland, where, however, it did not express the same rank and dignity as in England; the tenure not being military, but in fee-farm.—The Scottish thane seems to have been a hereditary tenant, paying the sum at which the land stood in the king's rental, and retaining his ancient authority strengthened and legalised. The title was in occasional use in Scotland down to the end of the 15th century. Hector Boece's notion of the Scottish thanes being all made earls, which has been adopted in Shakspeare's *Macbeth*, is devoid of historical foundation.

THA'NET, Isle of, forms the north-eastern corner of the county of Kent (q. v.), from the mainland of which it is cut off by the river Stour and its branches, and is bounded on the N. and E. by the sea. It is 10 miles in length, and from 4 to 8 miles broad; and contains 26,500 acres, of which 23,000 are arable, and 3500 in marsh and pastures. The surface is high, but in the main, level; the soil is in general light and chalky; the island, however, is rich and fruitful—agriculture being successfully pursued. Besides the ordinary crops, canary and radish seeds are largely grown. On the shores of the island are the well-known watering-places, Ramsgate, Margate, and Broadstairs; and on the North Foreland, in the north-east, there is a light-house, 340 feet above sea-level, and visible at the distance of 22 miles. The population in 1871 was 42,129; in 1881, 60,646.

The Isle of T., the British name of which was *Ruim* (a headland), was at one time separated from the mainland by a sea-passage, called the Wantsome, which in Bede's time was one-third of a mile wide, and was passable only at Sarre and Wade. The Wantsome was the general sea-passage toward London for the Danish ships, but in 1500 it became finally closed.

THANN, a town of Alsace, in the former French department of Haut-Rhin, prettily situated at the foot of a hill, crowned by the ruins of the castle of Engelburg, 13 miles west-north-west of Mulhouse. It contains a superb Gothic church, surmounted by a spire of delicate open work upwards of 300 feet high. Cotton cloths, chemicals, and machinery are manufactured.

THA'SOS, the most northerly island in the Ægean Sea, lies a few miles off the coast of Macedonia. Area 40 miles; pop. about 6000, who are scattered over a dozen villages. T. is mountainous, and on the whole, barren. The description of it given by Archilochus is still applicable: 'An ass's backbone overspread with wild wood.' It exports some oil, honey, and timber. In ancient times, the island was famous for its gold mines, which appear to have been worked from a very remote antiquity, and which, immediately before the Persian wars, yielded upwards of 300 talents yearly; but they have long since been abandoned. Some remains of the ancient town of T. still exist.

THEA. See Tea.

THE'ATINES, one of the more modern religious brotherhoods of the Roman Catholic Church, which played a very important part in the well-known internal movement for reformation which took place in central and southern Italy towards the middle of the 16th c., and which Ranke has described in his *History of the Popes*. The founders of this association were a party of friends: Cajetan di Thiene; John Peter Caraffa, at that time Bishop of *Theate* (from which the Congregation took the name *Theatine*); Paul Consiglieri; and Bonifazio di Colle. Cajetan and Caraffa, in concert with the two other friends named above, having resigned all their preferments, obtained a brief of Clement, dated June 25, 1524, formally constituting the new brotherhood, with the three usual vows, and with the privilege of electing their superior, who was to hold office for three years. One peculiarity of their vow of poverty deserves special notice: they were forbidden to possess property, and were to subsist entirely upon the alms of the faithful; and yet they were strictly forbidden to beg, or in any way to solicit charitable contributions. Their first convent was opened in Rome, and F. Caraffa was chosen as the first superior. He was succeeded in 1527 by Cajetan, and the Congregation began to extend to the provinces. After a time, however, it was thought advisable to unite it with the somewhat analogous order of the Somaschans; but this union was not of long continuance; Caraffa, who was elected pope, under the name of Paul IV., having restored the original constitution in 1555. By degrees, the T. extended themselves, first over Italy, and afterwards into Spain, Poland, and Germany, especially Bavaria. They did not find an entrance into France till the following century, when a House was founded in Paris under Cardinal Mazarin in 1644. To their activity, devotedness, and zeal, Ranke ascribes much of the success of that remarkable reaction against Protestantism which took place in the latter half of the 16th century. In later times, however, they do not appear to have played any notable part. Their most remarkable member in modern times has been the celebrated Sicilian, Father Ventura, author of the well-known work *Bellezze della Fede*, and familiar to Englishmen by the part which he took in the Italian revolution of 1849. At present, the Theatine order is confined to Italy and Sicily.

THE'ATRE, a place for public representations, chiefly of a dramatic or musical description. Theatres are of very ancient origin. They were found in every Greek city, both at home and in the colonies, and many very interesting specimens of the Greek theatres still exist in very good preservation. These were not built like modern theatres, with tiers of galleries rising one over the other, but were constructed with concentric rows of seats rising in regular succession one behind and above the other like the steps of stairs. These seats were frequently cut in the solid rock; and a place where the natural curve and slope of the ground rendered such excavation easy, was generally chosen. The seats, or audience department, were arranged in a semicircular form. In the centre, at the lowest point, stood the orchestra; and the proscenium, or place for the dramatic representation, formed the chord of the semicircular auditorium. Behind this was the scena, closing in the building with a solid wall, generally ornamented with pillars, cornices, &c. There was no roof, but the audience was probably protected from the sun's rays by a curtain stretching across the theatre. This form of theatre was also that adopted by the Romans, who built or excavated

large theatres in many of their important towns. The theatre of the Romans differed from their *Amphitheatre* (q. v.), the former being semicircular, the latter oval, and with seats all round. Of the theatres still remaining, that of Orange, in the south of France, is one of the finest, the auditorium being 340 feet in diameter. The illustration (fig. 1) shews the general form of these ancient theatres; and in this case the scena is more elaborate than usual. During the middle ages, theatres were unnecessary, and were never built. The few dramatic performances then in use, which were chiefly of the nature of holy mysteries, were represented in the cathedrals. From the remains still existing, however, there would seem to have been large open-air theatres at an early age in England. Of these, Piran Round in Cornwall is the best example. It is circular, with raised platforms all round for spectators, after the manner of the Greek theatres. With the revival of classical literature in the 16th c., the classical drama was also reproduced, and naturally along with it the classical form of theatre. The first specimens of what may be called modern theatres (although founded on the old Greek model, according to Vitruvius's description) were the Theatro Olympico, erected by Palladio in Vicenza; a similar one in Venice, also by Palladio; and another in Vicenza, by Serlio. In Italy and Spain, open courtyards, with galleries round them, were at first the scenes of dramatic performances. In France and England, where the climate did not so readily admit of open-air representations, the first plays performed were exhibited in tennis or racket courts, in which there were usually galleries at one end; and as this accommodation was found too limited, these were afterwards carried along the sides also. But dramatic literature soon became so important that buildings had to be designed for the express purpose of its representation. Accordingly, in Paris, the theatre of the Hôtel de Bourgogne was erected in the beginning of the 17th century. It was rebuilt, 1645, with tiers of boxes on a square plan. In 1639, the theatre of the Palais Royal was erected by Richelieu, and was long considered the best model. The present circular plan of the galleries, with pit sloping backwards, seems to have been first introduced in Venice in 1639; and the horse-shoe form of the boxes was first carried out by Fontana in the Tordinoni Theatre, at Rome, in 1675. The modern form of the auditorium was thus invented, and gradually improved and perfected, till in about a century similar theatres were erected all over Europe; the Scala Theatre at Milan, the largest in Italy, and the great theatre at Bordeaux, being built, the former in 1774, and the latter in 1777. The annexed plan of the Scala Theatre at Milan (fig. 2), will shew the general disposition of all the parts of the modern theatre on the largest scale. Modern theatres are all very similar in their general distribution. They are divided into two distinct departments—viz., the auditorium or audience department, and the stage or scenic department. In the former, the seats are invariably arranged on a sloping ground-floor or 'pit;' and on several tiers of galleries, extending in a semicircular or horse-shoe form round the house. On the ground-floor, the front rows of seats are generally set apart as 'dress stalls,' and the back part only is then called the 'pit.' In opera-houses, the stalls generally occupy the greater portion of the space, and the 'pit' is reduced to a minimum. In dramatic theatres, the tiers of galleries have the floors arranged in stages, rising above one another in such a manner as to enable the spectators all to see over those before them to the front of the stage. In theatres for operatic representation, the galleries have the floors laid level, and are divided all round into private boxes. The top tier is, however, sometimes left partially open, and has the seats on stages. In the larger opera-houses, there are usually retiring-rooms connected with each of the private boxes. There is also a 'crush-room,' or large saloon, in which the audience may promenade between the acts. In all French theatres and opera-houses, these saloons, or *foyers*, are very large, and elegantly fitted up. They are almost always over the entrance-hall. In some of the modern French theatres, there are two foyers, one over the other, for the different classes who occupy the dress circle and the upper galleries. The question has often been raised as to the best form for a theatre, both for hearing and seeing. It is a most difficult question to decide theoretically as regards hearing, but it is quite clear that the old semicircular plan of the Greeks is as nearly as possible the best for seeing, as it places the seats all round at an equal distance from the centre of the proscenium; and therefore we find, in cases where seeing well is all-important, as, for instance, in a *lecture theatre*, this old form is usually adopted. In an oblong house, on the other hand, the seats at the centre of the galleries are much further removed than those at the sides from the centre of the stage, and are thus at a disadvantage as regards hearing; while the side boxes are badly placed for commanding a view of the stage. The entrances and staircases of theatres are not generally so well arranged or so spacious as they should be. In French theatres, this is especially the case. In these, there is often only one narrow wooden stair on each side of the house, leading to all the galleries. Recent accidents by fire, and the risk the audience runs in case of want of proper

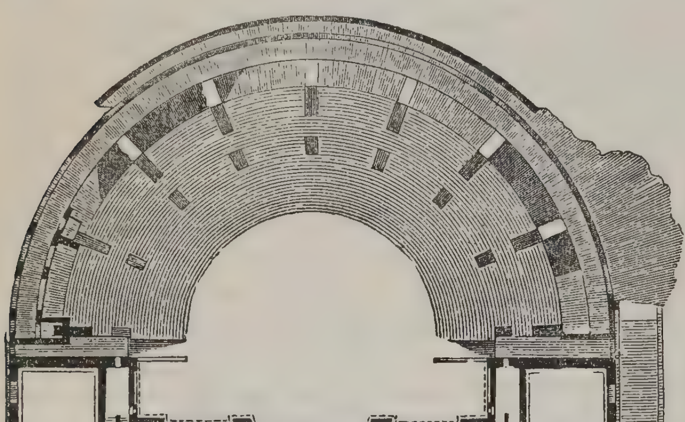


Fig. 1.—Plan of the Theatre at Orange—scale, 100 feet = 1 inch.
(From Ferguson.)

exits, have drawn attention to this subject, and the legislature will probably determine that there must be a separate, wide, and easy stair to each gallery —as, indeed, there usually now is in theatres recently built in Great Britain. For large galleries, these stairs should be at least six feet wide; and a strong iron hand-rail down each side of the stair would be found useful in case of a panic, to prevent a fatal crush. Besides the main passages for the use of the public, there ought to be private passages and doors leading to every part of the house, so that the manager may pass with ease to any point in the audience where his presence may be required.

The orchestra occupies the space immediately in front of the proscenium, and this space is arranged so as to be capable of being enlarged or contracted as occasion may require. The proscenium is a small portion of the stage which projects a few feet in front of the curtain, so as to enable the actors to stand well forward, that they may be distinctly heard by the audience. The part of the house on either side of the proscenium is that on which there is usually the greatest amount of ornament. The sides

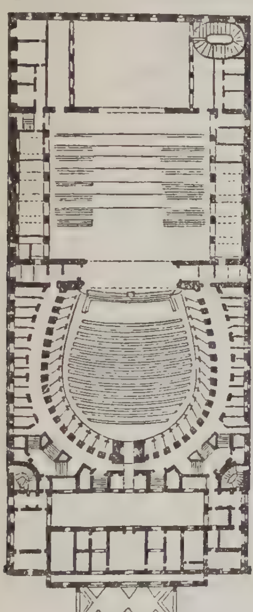


Fig. 2.—Plan of La Scala Theatre at Milan—scale, 100 feet = 1 inch.

(From Ferguson.)

and ceiling of the proscenium form, as it were, the frame through which the picture represented on the stage is seen; and as on it every eye must rest, it is made more ornate than the rest of the auditorium. The ceiling presenting as it does a large broad surface, and being well seen from many parts of the house, is also a place well adapted for ornament, and is generally made as handsome as possible. The same remark applies to the fronts of the dress circle and galleries. The stage extends backwards from the proscenium, and ought to be of considerable depth, so as to admit of the scenic effects, dissolving scenes, &c., now so much run upon. The great length of the stage from front to back is one of the most striking differences between the modern and the ancient theatre, and arises entirely from the introduction and development of movable scenery —an invention of the architect Baldassare Peruzzi, and first used in Rome before Leo X., in 1508. The floor of the stage is not laid level like the floor of a room, but is sloped upwards from front to back, so as to elevate the performers and scenes at the back, and render them more easily seen. The inclination of the stage is generally about half an inch to every foot. The stage department of a theatre not only requires to be very long, but also very lofty above, and deep below the stage, so as to allow the large frames on which the scenes are stretched to be raised or lowered in one piece. The stage itself is a most complicated piece of mechanism, a considerable part of it being made movable either in the form of *traps*, for raising or lowering actors, furniture, &c., or in long pieces, which slide off to each side from the centre, to allow the scenes to rise or descend. There are also *bridges*, or platforms constructed for raising and lowering through similar openings, some of them the full width of the stage. The traps and bridges are almost all worked by means of balance-weights, and the slides by ropes and windlasses. Besides the large *frames* above described as containing pictures occupying the full opening of the stage, there are other scenes which are pushed from the sides to the centre, each being only one half the width of the opening. These are called *flats*, and usually slide in grooves above and below. The grooves are arranged in clusters at intervals, having clear spaces between, called the *entrances*, through which the actors pass on and off the stage. But in modern French theatres and in the opera-houses—such, for instance, as Covent Garden Theatre these grooves are regarded as an encumbrance to the stage, and are entirely done away with. Their place is occupied by narrow openings or slits in the stage, below which are blocks running on wheels, and containing sockets, into which poles are dropped from above, and to these the flats are attached. Another advantage of this system is, that the gas-wings and ladders may be made movable, and slip backwards and forwards in the same manner as the flats. When occasion requires, the whole stage can thus be entirely cleared. According to the old plan of fixed grooves, only the centre of the stage can ever be cleared without unscrewing all the grooves, and the gas-wings must always remain in the same relative position. Besides the flats, there are also smaller scenes which move in the grooves. These are called *wings*, and are used to screen the entrance. Corresponding to the wings are similar narrow scenes dropped from above: these are called *borders*, and are used to hide the gas-battens. These and the scenes which are drawn up, the gas-battens, &c., are all worked by means of ropes from the *flies*, or galleries running along the sides of the stage at a high level. The ropes from these passing up into the barrel-loft (a space in the roof filled with large drums and barrels on which the ropes are coiled) and down again to the flies, form a complication which seems to the uninitiated observer an inextricable mass of confusion. While such is the usual arrangement connected with movable scenery, it is to be noted that latterly a very great change has been introduced into the higher class of theatres. This change consists in the dismissal of wings or sliding side portions of scenes with intervening gaps, and substituting for them large pieces of scenery resembling the sides and further ends of a room—an arrangement every way more natural. In cases of this improved kind, the actors enter on the stage and depart by doors. In connection with the stage, it is usual to have a large space set apart for containing scenery, called the *scene-dock*

This is frequently placed at the back of the stage, and may, on occasion, be cleared out, to give extra depth to the scene. There are also numerous apartments required in connection with the stage for the working of the theatre—such as manager's room; dressing-rooms for the actors and actresses; the 'green-room,' in which they assemble when dressed, and wait till they are called; 'star-rooms,' or dressing-rooms for the stars; the wardrobe, in which the costumes are kept; furniture stores, scene stores; 'property'-maker's room; and workshops for the carpenter, gas-man, &c. There must also be a good painting-room, which must necessarily be a large apartment, from the size of the pictures which have to be painted — each being the full size of the opening of the stage. The canvas for these scenes is stretched on frames, which move up and down by means of a winch with balance-weights; and thus the painter stands comfortably on the floor, and moves his picture up or down, so as to get at any part he wishes. An interesting point on the stage is the prompt corner, from which the prompter has command of all the lights of the house, and bells to warn every man of his duty at the proper moment. He has a large brass plate, in which a number of handles are fixed, with an index to each, marking the high, low, &c., of the lights; and as each system of lights has a separate main pipe from the prompt corner, each can be managed independently. The side of the house on which the prompter is seated is called the 'prompt side,' and the other side is called the 'O. P.' or *opposite* side.

The house, or auditorium department, is generally lighted by means of a large lustre or sun-light in the centre of the ceiling, and much of the effect of the building depends on how this is managed. There are also usually smaller lights round one tier of the boxes at least. The proscenium is lighted by a large lustre on each side, and by the foot-lights, which run along the whole of the front of the stage. These are sometimes provided with glasses of different colours, called mediums, which are used for throwing a red, green, or white light on the stage, as may be required. The stage is lighted by rows of gas-burners up each side and across the top at every entrance. The side-lights are called *gas-wings*, or *ladders;* and the top ones, *gas-battens.* Each of these has a main from the prompt corner. They can be pushed in and out, or up and down, like the scenery. There is also provision at each entrance for fixing flexible hose and temporary lights, so as to produce a bright effect wherever required. The mediums for producing coloured light in this case are blinds of coloured cloth. Another means of producing brilliant effects of light is the lime-light, by which, together with lenses of coloured glass, bright lights of any colour can be thrown on the stage or scenery when required.

Theatres are usually either very cold or insufferably hot. This arises from want of proper means of heating, and insufficient ventilation. The centre lustre is the great cause of ventilation, the draught caused by its heat drawing off the foul air at the ceiling. The suction caused by this withdrawal of air is naturally supplied from the great body of air in the stage. The stage ought, therefore, to be moderately heated by means of hot-water pipes or otherwise, so as to prevent cold draughts. The passages and lobbies round the house should also be heated in the same way, so that any air drawn in to the house may be properly tempered. An attempt has been made in Paris, of late years, to obviate the great heat and draught caused by the centre lustre, by doing away with the lustre, and making the ceiling partly of glass, with powerful lights and reflectors behind the glass in the roof. This mode of lighting is, however, of rather a subdued character for a theatre, although very appropriate to such chambers as the House of Commons, where it acts admirably. In Paris, they have also tried to supply fresh air from the gardens outside by means of a large tube, from which numerous small tubes branch and distribute the fresh air all round the theatre from the fronts of the boxes, round the proscenium, &c. The idea is an excellent one, and is said to answer well practically.

There is a novel and agreeable class of theatres now in use in Germany, but of which we have as yet no specimens in this country. It consists of a double auditory, one at each end of the stage. One of these auditories is arranged and lighted in the usual manner, and is called the Winter Theatre. The other auditory is called the Summer Theatre, and is so arranged that performances may be represented in daylight during the summer season. It is lighted by large windows in the outer wall, which corresponds in form to the interior curves of the galleries, and also by windows in the roof. The entrances are by means of staircases at each side, near the proscenium, and by wide corridors and balconies round the curve of the exterior wall. One of the most effective of these summer-theatres is the Victoria in Berlin, by Zitz.

The art of *dramatic representation* has undergone great changes. In ancient Greece, partly from the character of the subjects selected, and partly from the origin of the drama itself, costume and acting were conventional, artificial, and stereotyped. On this point, we quote the words of Witzschel, who has written a Handbook for Students on the Athenian Stage (Eng. transl. by Paul; ed. by T. K. Arnold, Lond. 1850): 'There can be no doubt,' says he, 'that the somewhat fantastic costume which was handed down without any change from one generation of actors to another was closely connected with the religious character of their tragic performances. The peculiar fashion and brilliant colours of the tragic wardrobe belonged rather to the Dionysian solemnities than to the stage. That Æschylus, by whom the greater part of it was invented, kept steadily in view the original intention of tragedy, is evident from the notices which we find in ancient writers of his theatrical dresses having been worn in other religious ceremonies and processions. It is only reasonable to suppose that he would have given to the tragic stage a wardrobe of a very different description, had he not been influenced by the conviction, that theatrical performances were in some sort a religious ceremonial. Another proof of the feeling generally entertained on this subject may be found in the ridicule with which Aristophanes overwhelms Euripides for introducing his heroes, not only in pitiable situations, but in dirty, ragged, and beggarly weeds, to the great disgust of all true-hearted Athenians, and the utter annihilation of tragic ideality. In the *Acharnenses*, the whole of the tragic poet's squalid wardrobe is held up to public derision.

'The tragic costume for male characters of the highest rank consisted of an embroidered tunic with sleeves, which, in the older personages, reached to the feet (*chiton poderes*), and in the younger to the knees. Over this was thrown a green pall, or long mantle (Gr. *surma*, Lat. *palla*), which also reached to the feet, and was richly ornamented with a purple and gold border. Persons of high but not royal rank wore a shorter red mantle, embroidered with gold, which was partially covered by a richly-embroidered, high-fitting scarf. Soothsayers wore over the tunic a kind of network, composed of woollen threads. A sort of waistcoat

(*kolpōma*) was also worn over the tunic. This was the costume of powerful and warlike sovereigns, such as Atreus, Agamemnon, &c. Dionysus (Bacchus) appeared in a purple tunic, which hung negligently from an embroidered shoulder-knot, and a thin, transparent, saffron-coloured upper robe, with a thyrsus in his hand. Even Hercules himself was not the athletic hero of the old mythology, with a lion's skin thrown loosely round his muscular limbs, but a solemn, theatrical personage, enveloped in a long mantle. The costume of a queen was a flowing purple robe, with a white scarf; and for mourning, a black robe, and blue or dark yellow shawl. Persons in distress, especially exiles, wore dirty-white, dark-gray, dingy-yellow, or bluish garments. . . . . To increase their height, the tragic performers wore the cothurnus, a sort of buskin, with high soles and still higher heels, which compelled them to walk with a measured and sounding tread, and a top-knot of hair, or toupet (Gr. *ongkos*), suitable to the age and condition of the character represented. A corresponding breadth of figure was produced by means of padding and by a sort of glove. Thus equipped, the tragic hero seemed a giant as compared with ordinary mortals. Lastly, they had the mask, a part of the ancient theatrical costume, which seems to us so strange and unnatural. For its meaning and origin, we must go back to the Dionysian festival, at which the excited crowd were wont, in honour of the jolly god, to smear their faces with lees of wine; and at a later period, when dramatic interludes were attempted, with vermilion, or to cover their cheeks with rude masks of bark. In the course of time, these primitive inventions were discarded, and their place supplied by linen masks, characteristically painted. For the sake of retaining this uncouth but distinctive appendage of the Dionysian festival, the Greeks were content to forego the delicate expression of feeling and eloquent play of features which are indispensable to a modern actor; but on the other hand, when we remember the enormous size of their theatres, which scarcely permitted the assembled thousands to hear what was said by the actors, still less to distinguish their features, we are forced to acknowledge that the practice of wearing masks was rather an advantage than an inconvenience.' The above description is, in the main, applicable to the Roman as well as the Greek theatres. The only additional point which it is necessary to notice is that, among the ancients, the acting of plays was not (as it is now) a regular and daily, but only an occasional affair, at festival seasons and the like. With the fall of the Western Empire, the disappearance of classic paganism and classic tastes, and the triumph of the christianised barbarians of the north and east, theatrical performances ceased. But the liking for such things is not artificial; it is natural and irrepressible; and gradually, as the ancient culture resumed something of its former sway, efforts were made, not, indeed, to re-enact the majestic tragedy of Greece (for its language was scarcely known), or the pungent comedy of Rome, but to throw into dramatic form the 'mysteries,' 'miracles,' and 'moralities' of the Christian religion. The rudeness of these medieval plays may perhaps suggest to us what Greek performances were before the days of Thespis. In fact, they were introduced as a means of edifying, as much as of amusing the ignorant laity, were customarily the work of monks, and were performed on festive occasions in the churches. It does not, however, appear that they were accompanied by any *scenic* representations. A raised wooden stage like that which forms the front of a travelling show, was all that the untutored taste of the times demanded. Nor are we to suppose for a moment that the slightest attention was paid to propriety of costume or speech. The personages rather than the actions, the ceremony rather than the dialogue, the moral rather than the matter, were the things looked to, and hence no subtle or artistic representation of life and character was possible. The development of the Modern Drama (q. v.) ultimately restored the art of the actor to its ancient dignity and importance; but it was long before those changes took place that gave theatrical performances their modern character. Good acting—that is to say, skilful impersonation of character and varied elocution—became quite common in England after the Restoration, and was not unknown before it; but appropriate costume and scenery were scarcely thought of until the time of Talma (q. v.), towards the close of last century. Since then, the best theatres have displayed a most creditable desire to reproduce, with something like verisimilitude, the outward 'form and pressure,' the garb, deportment, and air of the age represented.

The employment of female actors is of French origin, and dates from the first half of the 17th c.; but they were not permitted (without molestation) to tread the English stage till 1661. Before this innovation, female parts were performed by youths; and though it ill consorts with *our* ideas of adequate representation to conceive the parts of Desdemona Ophelia, Cordelia, &c., executed by those of another sex, it would appear that several actors obtained a wonderful success in this line.

The title of 'His Majesty's Servants,' which English actors once bore, originated in the fact that some of them were really members of the royal household. The king and particular nobles kept troops of actors for their own pleasure, whom they sometimes permitted to go about the country and perform. The first prince we read of that gave his 'servants' such permission, was Richard, Duke of Gloucester (afterwards Richard III.). In Queen Elizabeth's time (1571), the Earl of Leicester's 'servants' were licensed to open the first *public* theatre in England, and it is owing to the circumstance of actors having originally formed part of the household of the king that a licence from the Lord Chamberlain is still necessary to the opening of a theatre.

For an anecdotical and amusing history of the English stage, see *Their Majesties' Servants*, by Dr Doran (Lond. 1865).

THEATRES, LAWS AS TO. In Great Britain, all theatres must be licensed, either by virtue of letters patent from Her Majesty, or by licence from the Lord Chamberlain for the time being, or from justices of the peace. The Lord Chamberlain grants licences to all theatres (not being patent theatres) within the English metropolis, and within the places where Her Majesty occasionally resides, except New Windsor and Brighton. For every licence of the Lord Chamberlain, a fee not exceeding 10s. per month is charged. In other parts of Great Britain, the justices of the peace of the county, city, or borough must be applied to for a licence; and after the usual notice, they hold a special session, for the purpose of granting licences to theatres, the fee payable being a sum not exceeding 5s. per month. It is only to the actual and responsible manager of the theatre that a licence can be granted, and his name and place of abode must be printed on every play-bill. The manager must find sureties to observe the rules issued by the Lord Chamberlain and justices, which rules relate to the days and hours of keeping open. and the insuring of order and decency. A penalty of £10 is imposed, by statute 6 and 7 Vict. c. 68, on any actor or manager concerned in unlicensed places

A copy of every new play, epilogue, or prologue, or alteration of the same, intended to be produced at any theatre in Great Britain, must be sent to the Lord Chamberlain, by the manager, seven days before such production; and for examination of such plays and alterations of plays, he may charge fees not exceeding ten guineas, according to a scale fixed by him. He may forbid the acting of any play, whenever he considers it to be fitting to the preservation of good manners, decorum, or the public peace, to do so. To act a play not allowed or disallowed, subjects each actor and manager to a penalty of £50. It has been decided by the courts, that a booth used as a temporary or portable theatre requires a licence, and that any dualogue or dramatic performance by two persons is a stage-play, and therefore subject to the licence. Of late, the policy of placing the theatres so entirely under the control of the Lord Chamberlain and justices has been disputed, especially as the increasing practice of introducing theatrical performances at public supper-rooms has led to some vexatious prosecutions at the instance of the licensees of regular theatres.

THE'BAINE. See OPIUM.

THEBES, the name of a celebrated Egyptian city, called by the Egyptians Taape, or Taouab; by the Hebrews, No-Amen; by the Greeks, Thebæ; and at a later period, Diospolis Magna. It lies in the broadest section of the valley of the Nile, in about lat. 26° N., and was formerly the capital of Southern or Upper Egypt. Its ruins, the most extensive in that country, comprise nine townships, the most remarkable of which are Medinat Habu, Gournah, Karnak, and Luxor. Its local and eponymous god was Amen-Ra, or Jupiter Ammon; and its foundation traditionally dated from the time of Menes, the founder of the monarchy, although no remains of so early a date have been discovered on the site. Recently, however, excavations have brought to light constructions of the 11th dynasty, who appear to have founded the original temple of the god. The Nile flows through the midst of the ancient city, and divides it into four principal quarters: Karnak and Luxor, which lie on the east bank, and Gournah and Medinat Habu, on the west bank of the river. The most flourishing period of the city was under the 18th, 19th, and 20th dynasties, or from about 1500 to 1000 B.C., when it had supplanted Memphis, the ancient capital of the Pharaohs. The more central situation of this city probably caused it to rise into importance, for it was secure against the northern enemies of Egypt; hence, under these Diospolitan dynasties, the worship of Amen-Ra arose in all its splendour; magnificent palaces and temples were built in its different quarters, to which additions were made by later monarchs, and even by the Ptolemies and Romans till the time of the Antonines, in the 2d C. A.D. Here, too, were the cemeteries of the Theban monarchs and the officers of their courts, colleges of priests, and the seat of royal government. It was enriched by the spoils of Asia and the tributes of Ethiopia, and its fame and reputation had reached the early Greeks, Homer describing it by the epithet of Hekatompylos, or City of a Hundred Gates, in allusion to its propylæa, for T. was never a fortified city. In the plenitude of its power, it sent forth an army of 20,000 war-chariots; but the Bubastite and Tanite dynasties removed the capital again to Sais and Memphis, and T. declined in importance, although retaining much of its ancient grandeur. At the Persian conquest, Cambyses obtained a spoil of nearly £2,000,000 from the city, destroyed many of its noblest monuments, and injured its political pre-eminence. The foundation of Alexandria by Alexander the Great, and other causes, still further injured the city; and although some repairs were made under the subsequent monarchs, its grandeur had departed. At the time of Strabo, T. was only a cluster of small villages. When that geographer visited the city, its extent was about 9½ miles in length (according to Diodorus), its circuit was about 16 miles. Its temples, tombs, and ruins were visited by the Roman travellers; and Germanicus and Hadrian inspected the sculptures of the temples. At a later period, a considerable Christian population existed under the empire; but the inhabitants fled at the Arab invasion to Esneh; and T. is now inhabited only by a few Arab families of Fellaheen, who obtain a precarious livelihood by guiding travellers over the ruins, or rifling the tombs for antiquities. At Gournah, is to be seen the Memnoneion, built by Ramesses II.; with a colossus of that monarch, weighing 887½ tons, the largest statue in Egypt, broken. This is supposed to be the palace of Osymandyas, described by Hecatæus, and is of considerable extent. In this quarter are two palace-temples of Amenophis III., and the vocal Memnon, or celebrated colossus of that monarch, supposed by the ancients to emit a sound at sunrise. At Medinat Habu is a pile of buildings, commenced by Thothmes I., of the 18th dynasty, with courts and propylæa, built by Ramesses III. or Rhampsinitus, and sculptures representing his victories over the Philistines, the life in his harem, the riches of his treasury, and a calendar with inscriptions dated in the twelfth year of his reign. Here, 8000 feet to the north-west, are the cemeteries of sacred apes; and 3000 feet beyond, the valley of the Tombs of the Queens, consisting of 17 *syringes*, or sepulchres, supposed to be the tombs of the Pallacides of Amen, mentioned by Diodorus and Strabo. Near them are the Biban-el-Meluk, or tombs of the monarchs of the 19th and 20th dynasties, 16 in number, the most interesting of which are that of Sethos I., called Belzoni's, after its discoverer, and those of Ramesses III. and Siptah. At Gournah itself are the tombs of functionaries and others, and this latter site has enriched the museums of Europe with antiquities of various kinds. The palaces of the Luxor quarter were founded by Amenophis III. From hence was removed the obelisk of the Place de la Concorde in Paris. Still more magnificent than any of these is the temple of Karnak, the sanctuary of which, built by Osertesen I. of the 12th dynasty, was added to by the monarchs of the 18th dynasty. The most remarkable part of this wonderful mass of courts, propylæa, and obelisks, is the great hall, 170 feet by 329 feet, built by Sethos I. and Ramesses II., having a central avenue of 12 massive columns, 66 feet high, 12 feet in diameter; and 122 other columns, 49 feet 9 inches high, 27 feet 6 inches in circumference; and 2 obelisks, 92 feet high, and 8 feet square. In this temple is also the so-called Portico of the Bubastites, built by Shishak I., recording his expedition against Jerusalem, 971 B.C. The Ptolemies also restored this building.—Diodorus, i. 45; Strabo, xvi. p. 816; Wilkinson, *Topography of Thebes* (8vo, Lond. 1835); Champollion, *L'Egypte*, i. p. 199, and foll.; *Lettres*, pp. 63—173; Belzoni, p. 58.

THEBES, the principal city of Bœotia, in ancient Greece, was situated in the southern part of th country, on the slopes of Mount Teumessus, and between two streams, the Dirce and the Ismenus. According to the prevalent tradition, T. was founded by a colony of Phœnicians under Cadmus (q. v.), after whom the city was called Cadmeia—a name subsequently restricted to the citadel; but passing over the long series of picturesque and tragic myths that

have given it its pre-historic fame (in which the central figure is Œdipus), we first catch a quasi-authentic glimpse of Theban history in the 8th c. B.C., when one Philolaus, a Corinthian, settled in the place, and drew up a code of laws for the inhabitants. It is not till near the end of the 6th c. B.C., however, that we reach a purely historical period—the earliest well-attested event being the dispute between T. and another Bœotian city, Platææ, which involved the former city in an unsuccessful war with Athens. Henceforth, the relations of T. and Athens were, except for brief intervals, marked by bitter enmity. During the Persian war, T. shamefully sided with the Asiatic invader, and, in consequence, lost much of her power and prestige. Athens proposed to deprive her of her supremacy over the Bœotian confederacy; but Sparta, always jealous, even to spitefulness, of her Attic rival, interfered, and positively forced the other Bœotian cities to acknowledge anew their unworthy mistress. When the Peloponnesian war broke out, T. took part with Sparta, and at its close, was eager for the destruction of Athens; but soon after, it became jealous of the overgrown power of its ally, and gave a friendly welcome and shelter to those Athenians whom the oppression of the Thirty Tyrants (q. v.) compelled to abandon their city. It was from T. that Thrasybulus and his co-patriots started on their famous expedition for the deliverance of Athens, accompanied by a body of Theban citizens. A keen and bitter antagonism now sprung up between T. and Sparta, which, after many vicissitudes, ended in a great military struggle (379—362 B.C.), in which the former city, under the heroic guidance of Epaminondas (q. v.), achieved a brilliant triumph, and for a time held the position of the foremost power in Greece. It was now the time for Athens to revive her ancient animosities; and for a while they had free play. At length, the eloquence of Demosthenes induced both states to unite in opposition to the encroachments of Philip of Macedon; but it was too late; and in 338 B.C., the battle of Chæroneia crushed the liberties of Greece. After Philip's death, the Thebans made a fierce but unsuccessful effort to regain their freedom. Their city was taken by Alexander, who levelled it to the ground, and sold the entire population—men, women, and children—into slavery. For 20 years it remained an utter desolation; but in 315 B.C. it was rebuilt by Cassander, who gathered into it all the Thebans he could find in Greece. It was again destroyed by the Romans, and did not recover till about the decline of the empire. During the 11th and 12th centuries, it was the seat of a considerable population, engaged in the manufacture of silk; but under the Turks it again declined, though it has still a modern representative, Thebes, or Thiva, with a pop. of 9000. Scarcely a single relic of antiquity has survived the ravages of time.

THE'CLA, a virgin saint of the early church, whose existence may be considered historical, although all, or almost all, the details regarding her are legendary, being in great measure founded upon an apocryphal book, now lost, entitled *The Periods (circuits) of Paul and Thecla*, the unhistorical character of which is declared by Tertullian (*De Bapt.* ii. 17), and by St Jerome in his catalogue of ecclesiastical writers. According to the legend, T. was a member of a noble family of Iconium in Lycaonia, where she was converted by the preaching of St Paul, and having devoted herself to a life of virginity, suffered a series of persecutions from her intended bridegroom, as well as from her parents. As to the manner of her death, nothing is certain. She is styled in the Greek martyrologies the *proto-martyress*, as Stephen is the proto-martyr; while in the Roman Breviary, she is said to have died at the age of 90 in Seleucia, where her tomb was anciently pointed out. The *Acts of Paul and Thecla* was among the books stigmatised as 'apocryphal' by Pope Gelasius: but it is now lost.

THEFT. See LARCENY.

THE'INE. See CAFFEINE and TEA.

THEISS, an important affluent of the Danube, and the chief river of Hungary, rises by two streams, the Black T. and the White T., in the Carpathian Mountains, on the borders of Galicia. It flows first south through a mountain-pass; but after receiving the Viso from the south-east, it changes its course to north-west and south-west, flowing past Tokay to Szolnok, where it curves toward the south; and after running parallel to the Danube for upwards of 300 miles, it joins that river about 5 miles below the town of Titel. The principal towns upon its banks are Szigeth—about 50 miles from its source—Tokay, Szolnok, Csongrad, and Szegedin; and its chief affluents are, on the right, the Vorsova, Bodrog, and Hernad; on the left, the Szamos, Körös, Maros, and Bego, and of these the most are of considerable size, and navigable. The T. is navigable at Szegeth for small vessels, at Nameny for steamers, and at Szolnok for large vessels. At Szöllös, it enters upon the plain, and below this point, its fall is trifling, its course sluggish and very winding, and its banks low and marshy. At Tokay, it is 300 feet broad; at Szegedin, 400 feet; and at Titel, 740 feet. Its length, in direct line from source to mouth, is 280 miles; the entire length, including windings, is 828 miles.

THELUSSON ACT is an act of parliament, 39 and 40 Geo. III. c. 98, passed for the purpose of checking the disposition of testators to accumulate the income of their estates until they should form a large fortune. The late Mr Thelusson had, by his will, directed his personal property to be invested in land, and the rents and profits of the land to be so purchased, and of his other real estate, to be accumulated during the lives of all his descendants who should be living at the time of his death, or born in a certain time thereafter; and then he limited the accumulated property in favour of certain of his descendants who might be then living at that distant time. The property was said to have consisted of landed estates worth £4000 a year, besides personalty of about half a million; and it was estimated that the accumulated fund would amount to above nineteen millions. The testator's object was to create enormous wealth, for the purpose of founding three families to spring from his three sons. For half a century, the questions arising out of this will have been discussed in various forms; but the legislature, soon after the testator's death, took the earliest opportunity of preventing in future testators accumulating the income in this way for more than 21 years, and the above act was passed for that purpose. In the courts, the first attempt to upset the will of Mr Thelusson was to make out that it was too uncertain to be carried into execution—next, that the accumulation was illegal—next, whether males claiming through females would be entitled to a share: all of which attempts to upset the will failed. Ultimately, however, the fund proved not to be so large as was anticipated, and was distributed among a greater number of claimants. The eldest son was created Baron Rendlesham in 1806. The litigation ended by a decree of the House of Lords in 1858. The Thelusson Act has been extended to Scotland.

THE'MIS (Gr. 'what is established by old law'), in Greek Mythology, was the daughter of Uranus and Gē (Heaven and Earth), the wife of Zeus, and

by him, mother of the Horæ (Hours) and Mœræ (Fates), as also of Eunomia (Equity), Dikē (Justice), and Eirēnē (Peace). She was regarded as the personification of order and justice, or of whatever is established by 'use and wont;' and as such was charged by Zeus to convoke the gods, and preside over them when assembled, being likewise represented as reigning in the assemblies of men. In modern art, T. is represented as having her eyes bandaged, and at the same time holding a pair of evenly-balanced scales in one hand, with a sword in the other.

THEMI'STOCLES, the great Athenian general and statesman, was the son of an obscure citizen of Athens, and was born about 514 B.C. He was actuated by excessive ambition from a very early period, and began his public career by setting himself in opposition to the principal men of the state, and chiefly Aristides, 'the Just.' It is uncertain whether he was at Marathon, but there is no doubt that the laurels gained there by Miltiades fired T.'s ambition. From the time (483) that he got his inconveniently upright rival, Aristides (q. v.), ostracised, he was regarded as the political leader in Athens, being made Archon Eponymus in 481. In order to recover for Athens the naval supremacy in Greece, and that she might be prepared to meet the expected Persian invasion, he persuaded the Athenians to devote the proceeds arising from the silver mines at Laurium to the construction of a fleet, sagaciously foreseeing that his country's only chance of overcoming her enemy was by sea. In the battles of Artemisium and Salamis (480), disastrous for the Persians, T., commander of the Athenian fleet, the largest in Greece, to avoid dissensions, was content to serve under Eurybiades the Spartan. On both these occasions, it was only by the greatest tact, combined with threats and a judicious outlay of the bribes which he himself had received in profusion, that T. could induce the other commanders to come to an engagement with the Persians. On the night previous to Salamis, he sent a faithful slave to tell Xerxes that unless he came up next day, the Greek fleet would be scattered, and he would miss the chance of an engagement; thus securing either victory to the Greeks, or the favour of Xerxes to himself in case of defeat. See SALAMIS. In several other ways did the wily T. contrive to provide for himself a safe retreat at the Persian court in case of disaster. The victory at Salamis raised his reputation to the highest point. Not neglecting his own personal aggrandisement, he sailed round among the Grecian islands, and on various pretexts, extorted enormous sums from the inhabitants. Shortly after the Persian invasion, his fellow-citizens began to see through him, and he was accused of bribery and extortion. In 471, he was ostracised, and retired to Argos; and finally, to escape being tried for treason, in which he was implicated by the correspondence of Pausanias, he betook himself, in 465, to the court of Artaxerxes, king of Persia; but before he would see the king himself, got permission to wait a year, during which he made himself master of the language and usages of Persia. At the end of this time, he managed to raise himself so highly in the king's favour, that, after the Persian fashion, the town of Magnesia was appointed to supply him with bread, Lampsacus with wine, and Myus with other provisions. He lived securely at Magnesia until his death in 449. Some authorities assert that he poisoned himself. A monument was erected to T. in the market-place of Magnesia, and it is said that his bones were secretly taken to Attica, and burned there. Undoubtedly, T. was a man of very great sagacity and determination, had a quick and keen perception of difficulties both present and future, which his ready invention, backed by promptness of action, enabled him to meet and overcome. On the other hand, he appears to have been possessed of no moral principles, his greatest ambition apparently having been to make himself, by fair means or foul, the greatest man in Greece.

THE'NARD'S BLUE. See BLUE.

THEOBALD, LEWIS, was the son of an attorney at Sittingbourne in Kent, at which place he was born towards the close of the 17th century. His father's business, for which he was educated, proved not much to his mind; and betaking himself to literature, he published, in 1714, a tragedy entitled *Electra*, which he followed up by a number of other dramas. As a poet, he had scant success, and is long since utterly forgotten; but as the favourite butt of Pope, he is immortalised in the *Dunciad* of that writer. Besides this unenviable distinction, 'piddling Theobald,' as Pope contemptuously termed him, is not without some fair claim to be honourably remembered as one of the most laborious and useful of the early editors and commentators on Shakspeare. In this capacity, dull as he undoubtedly was, he did good service to the poet, which has since been sufficiently recognised. The hatred of Pope he incurred by a pamphlet published in 1726, entitled *Shakspeare Restored, or Specimens of Blunders committed or unamended in Pope's Edition of this Poet;* and if he could not compete with his adversary in wit, he proved himself a much more competent editor of Shakspeare by his edition in 7 volumes 8vo, published in 1733, which quite extinguished that of his rival. His knowledge of our earlier drama was extensive and minute; and to his judicious application of it, in elucidating the text of the great poet, we remain to this hour not a little indebted. He died in September 1744.

THEOBRO'MINE ($C_7H_8N_4O_2$) is a crystallisable principle present in chocolate. It is extracted from the cacao-nuts (the seeds of *Theobroma cacao*) in the same manner as caffeine or theine is extracted from the coffee, tea, &c., in which that substance occurs. It is less soluble in water than caffeine, but resembles that substance in forming crystallisable salts with some of the acids. By dissolving theobromine in a solution of ammonia, and adding nitrate of silver, a gelatinous precipitate is obtained, which, by boiling with a solution of ammonia, yields a crystalline mass of theobromide of silver ($C_7H_7AgN_4O_2$), in which 1 equivalent of hydrogen is replaced by 1 of silver. This compound, when treated with iodide of methyl, yields iodide of silver and caffeine, which latter may be extracted with alcohol. Hence we arrive at the remarkable conclusion, that caffeine ($C_8H_{10}N_4O_2$) must be regarded as methyl-theobromine, $C_7H_7(C_2H_3)N_4O_2$.

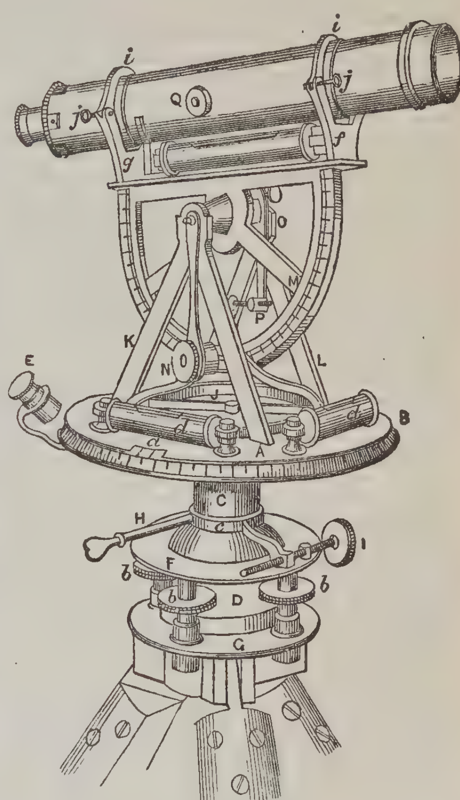
THEO'CRACY, literally, 'government by God,' is the name given to that constitution of a state in which the Almighty is regarded as the sole sovereign, and the laws of the realm as divine commands rather than human ordinances. Under such a view, the priesthood necessarily become the promulgators and interpreters of the 'divine commands,' and act as the officers of the invisible Ruler. The most famous example of a theocracy is that established by Moses among the Hebrews.

THEO'CRITUS, the creator and most celebrated composer of bucolic poetry, was the son of Praxagoras and Philinna, and born at Syracuse. The date of his birth is unknown, but the period o his greatest literary activity was probably 272 B.C. About the close of the reign of Ptolemy Soter, he visited Alexandria, where he received instruction

and made his first successful essays in poetry. He came to be patronised by Ptolemy Philadelphus, who assisted his father, Ptolemy Soter, in the government of Egypt; and in honour of his patron, he composed, about 285 B.C., his 14th, 15th, and 17th idyls. He further formed the acquaintance of the poet Aratus, to whom he addressed his 6th idyl. He subsequently revisited Syracuse, where he continued to reside under Hiero II. From his 16th idyl, it may be concluded that he was dissatisfied with the political state of Sicily, and also with the insufficient rewards which his poems received from Hiero; and that, in consequence, he fixed his attention, during his declining years, rather on the life of the country than of the court, and on those scenes of rural nature which form the chief subject of his poetical remains. The idyls of T. are principally representations, dramatic and mimetic in their character, of the every-day life of the Sicilian peasantry. They have been successfully imitated by Virgil, and have given origin at least to that so-called pastoral literature of medieval and modern times, which is, however, totally deficient in the simplicity, fidelity, and therefore poetry of the Syracusan author. T. knows nothing of the imaginary shepherds of a fictitious Arcadia; his dramatic simplicity and truth are in wide contrast to the affected sentiment, the unnatural innocence, and the artificial simplicity of that unreal world. Comedy and pathos enter freely into his representations of rural Sicilian life, and his idyls retain the charms of freshness and nature even to the present day. They are 30 in number, though all of them are not strictly bucolic, or even genuine. They are written in a mixed dialect, in which the softened Doric prevails; and together with a few lines from a lost poem called *Berenice*, and 22 epigrams in the Greek Anthology, make up his remains, of which the best editions are those of Meineke and Paley; and the best translation in English, that of Dr M. J. Chapman.

THEO'DICY (Gr. *Theos*, God, and *dike*, justice; Lat. *Theodicæa*, the judgment of God), a name given to the exposition of the theory of Divine Providence, with a view especially to the vindication of the attributes, and particularly of the sanctity and justice of God in establishing the present order of things, in which evil, moral as well as physical, so largely appears to prevail. The name is of modern origin, dating from the close of the 17th c., or the beginning of the 18th c.; but the theory itself, as well as the mysterious problem which it is meant to resolve, is as old as philosophy itself. See EVIL. The first to consider the question in its integrity was the celebrated Leibnitz (q. v.). His work entitled *Essais de Theodicée sur la Bonté de Dieu, la Liberté de l'Homme, et l'Origine du Mal*, was published in 1710. It rose at once to the very highest point of popularity, and was translated into almost every European language. The leading principle of Leibnitz's vindication of God's goodness is the well-known optimistic theory which has been explained elsewhere (see OPTIMISM); but he has been followed by several writers in different countries—as Balguy, Werdermann, Kinderater, Creutzer, Benedict Kapp, and many others. Of these writers, it may be said in general, that they have followed the same method, and have addressed themselves to the same view—viz., the reconciliation with the goodness, the sanctity, and the justice of the one God, the existence of those manifold evils, physical or material, as well as moral, which appear in the present order of things. This view, it will be seen, is strictly limited to one single problem. But in the discussions of the new philosophic systems, and especially that of Hegel, which have arisen in Germany, new difficulties regarding the Christian idea of God have arisen out of the rationalistic notions of existence in general. To meet those difficulties, a new theodicy has become necessary, and it has begun to occupy the attention of philosophers, especially in France. Two works in particular addressed to this view of the subject may be noticed: the first is M. Maret's *Christian Theodicée, or Comparison of the Christian and the Rationalistic idea of God*, 1845; the second is that of the Jesuit philosopher, Père Gratry, who has devoted the first volume of his course of philosophy, *De la Connaissance de Dieu*, to this special subject. This work was published at Paris, 1853.

THEO'DOLITE (Gr. *theaō*, I see, *dolichos*, long), an instrument much employed in land-surveying for



Theodolite:

A, B, the horizontal limbs; *a*, the vernier plate, which turns; C, the vertical axis; D, the ball or socket movement; *d*, *d*, spirit levels; E, a magnifier to read off the degrees; F, G, Plates held together by the ball D; *f*, a screw to adjust the level or line of collimation; *b*, *b*, *b*, milled screws to adjust the instrument, and set in level; *g*, a screw to adjust the telescope laterally; H, a clamping screw, by which means the collar *c* may be tightened to the axis C, and kept from moving; J, the magnet box; I, a slow-motion screw, by which the instrument is moved more exactly than could be done by the hand; *i*, *i*, clips, to reverse the telescope by screws, *j*, *j*; K, L, frames into which the pivots are placed, on which the vertical arc M is turned round, and on which the telescope is fixed; N, a microscope for reading off the degrees; O, a clamp screw; P, a slow-motion screw, by which the vertical arc and telescope are moved; Q, a milled screw for moving the object-glass of the telescope.—From Cresy's *Encyclopædia of Civil Engineering*.

the measurement of angles horizontal and vertical, is neither more nor less than an altitude and azimuth instrument, proportioned and constructed

so as to be conveniently portable. Like all instruments in very general use, the variations in its construction are almost numberless; but its main characteristics continue unaltered in all forms. It consists essentially of two concentric circular plates of copper, brass, or other material (the upper plate, or *upper horizontal*, either being smaller, and let into the lower, or *lower horizontal*, or the rim of the lower raised round the outside of the upper), moving round a common axis, which, being double, admits of one plate moving independently of the other. Upon the upper horizontal rise two supports, bearing a cross bar, which is the axis of a *vertical circle* moving in a plane at right angles to the former. This latter circle either has a telescope fixed concentric with itself, or a semicircle is substituted for the circle, and the telescope is laid above, and parallel to its diameter. The circles, as their names denote, are employed in the measurement of horizontal and vertical angles. For these purposes, the outer of the horizontal circles is graduated, and the inner carries the index-point and the Verniers (q. v.); the vertical circle is also graduated, and the graduations are generally read off by an index-point and vernier firmly attached to the supports. The upper horizontal is furnished with two levels placed at right angles to each other, for purposes of adjustment, and has a compass-box let into it at its centre. The stand consists of a circular plate supported on three legs, and connected with the lower horizontal by means of a ball-and-socket joint; the horizontal adjustment of the instrument being effected by means of three or four (the latter number is the better) upright screws placed at equal distances between the plates. The telescope is so fixed as to be reversible, and the adjustments are in great part similar to those of other telescopic instruments, but are too numerous and minute to be here detailed. Both horizontal plates being made, by means of the screws and levels, truly level, the telescope is pointed at one object, and the horizontal angles read off; it is then turned to another object, and the readings-off from the graduated circle again performed; and by the difference of the readings, the angular horizontal deviation is given; and when vertical angles are required, the readings are taken from the vertical circle in a similar manner.

THEODORE, of Mopsuestia, a well-known writer of the Syrian Church, and especially notable in connection with the controversy of 'The Three Chapters,' was born of a wealthy and distinguished family at Antioch, in the first half of the 4th century. He was the school-fellow and friend of St John Chrysostom, and his fellow-pupil under the philosopher and rhetorician Libanius; and he was induced, by the earnest exhortation of Chrysostom, to join with him in embracing the monastic life. His theological and scriptural studies were made under Flavian of Antioch and Diodorus of Tarsus; and having received priest's orders, he resided for a time at Antioch, where his learning and eloquence won the highest applause; and afterwards at Tarsus, under his old teacher Diodorus. About the year 390, or a little later, he was chosen Bishop of Mopsuestia in Cilicia. In 394, he preached in the presence of the Emperor Theodosius at Constantinople, on occasion of a synod held in that city. Of his further history, little is known; but his literary activity must have been prodigious, if we can judge by the contemporary accounts, and by the number of the works which are ascribed to him, but of which only fragments now remain. The most important of these consisted of commentaries on almost all the books of Scripture, and various polemical writings. A supposed tendency to Pelagian and Nestorian errors was observable in T., and was in part the occasion of the long controversy of the Three Chapters. This controversy, however, did not arise till long after the death of T., which took place about 427, after he had occupied the see of Mopsuestia for 36 or 37 years. Considerable fragments of T.'s commentaries have been published by Cardinal Mai in his *Spicilegium Romanum*, and some of his works still exist in Syriac.

THEODORE, Abyssinia. See SUPP. in Vol. X.

THEODORE'TUS (Gr. *Theodoretos*, God-bestowed), a celebrated church historian and theological writer, was born at Antioch, about the year 393, and received his name from the circumstance of his being supposed to have been granted as the fruit of earnest prayer, to his parents, who had long been childless. He was educated from early childhood in a monastery, where, among his fellow-pupils, were Nestorius and John of Antioch, both afterwards celebrated in the controversy which takes its name from the former. He was admitted among the clergy of Antioch; and at a comparatively early age became Bishop of Cyrus, a city of Syria. His zeal and eloquence were the theme of universal praise, and his success in bringing unbelievers and heretics to the church was almost unprecedented. In the controversies on the subject of Nestorius and his doctrines, which followed the condemnation pronounced by the council of Ephesus in 431, T. for a time took a warm and active interest. The party of Nestorius was with difficulty brought to an accommodation with Cyril of Alexandria, in virtue of which the condemnation of Nestorius by the council was acquiesced in by John, Bishop of Antioch. For a time, T. dissented from this condemnation of Nestorius; and he not only expressed these sentiments in a letter addressed to Nestorius himself, but also wrote formally against the celebrated anathemas of Cyril directed against Nestorianism. But he afterwards saw the necessity of yielding, and concurred in the deposition of those bishops who still persisted in their rejection of the council of Ephesus. Nevertheless, he by no means fully accepted the views of Cyril; and when, on Cyril's death, the opposition to Nestorianism began to develop, under the turbulent partisanship of his successor in the see of Alexandria, Dioscorus, into the contrary error of Eutychianism, T. endeavoured to induce Dioscorus to abandon his extreme opinions. Failing in the attempt, T. composed the work which has often figured in modern controversy, on account of the well-known passage as to the change of the Eucharistic elements which it contains, entitled 'Eranistes or the Many-shaped.' This work was regarded by Dioscorus as a renewal of the Nestorian error, and he accused T. to Domnus, the new Patriarch of Antioch, of that heresy. T. replied with great moderation; but Dioscorus persisted; and having engaged the imperial court on his side, succeeded in obtaining from the Emperor Theodosius II. an order confining T. within the limits of his own diocese. Meanwhile, the Eutychian controversy reached its height, and Eutyches (q. v.) having been first condemned by Flavian, Bishop of Constantinople, in a synod held in 448, was afterwards absolved in the celebrated Robber-council of Ephesus, under Dioscorus, in 449. The latter council not only excluded T. from its sittings, but formally deposed him from his see; whereupon he was compelled to retire to the monastery at Antioch in which he had received his first education. All this, however, was reversed by the general council of Chalcedon, in 451. T. did not very long survive his restoration. He died about the year 457. His works fill four volumes folio, reprinted in ten parts 8vo by Schulze (Halle, 1768—1774), and consist of commentaries on many books of the Old Testament and the

whole of St Paul's Epistles; a *History of the Church*, from 325 to 429 A.D., in five books; *Religious History*, being the lives of the so-called Fathers of the Desert, a series of most curious and interesting pictures of early ascetic life; the *Eranistes*, a dialogue against Eutychianism; *A Concise History of Heresies*, together with orations and a large number of letters. Of these works, his *History of the Church* is by far the best known, as well as the most important and interesting. See Schulze's edition of *Theodoreti Cyrensis Opera*.

THEODORIC, surnamed THE GREAT, the founder of the Ostrogothic monarchy, which comprised Italy, Sicily, South-eastern Gaul, Rhætia, Noricum, Pannonia, and Dalmatia, was born on the banks of the Neusiedler See, to the south of Vienna, in 455 A.D. His father, Theodemir, was one of the three brothers (the other two were Walamir and Widimir) who, on the death of Attila (453 A.D.), freed their nation from the yoke of the Huns, and being the representatives of the royal line of the Amali, exercised a united sovereignty over it; but the death of Walamir, and the departure to Italy and Gaul of Widimir with a part of the nation, left T.'s father sole ruler of the Ostrogoths who remained in Pannonia. Previous to these events, T. had been given as a hostage to the Eastern emperor, in accordance with whose directions he had been accustomed to all kinds of athletic and martial exercises, so that after his return (473) home, he was well qualified to fill the post of ruler of his ferocious and valiant kinsmen, which, by the death of his father, was left vacant in 475. In the previous year, the Ostrogoths had obtained parts of Mœsia and Dacia as settlements from the Emperor Zeno, and for years they gallantly defended the empire from foreign aggressors, other Gothic tribes included; but the impolitic faithlessness of Zeno produced in revenge the devastation of Thessaly and Macedonia, and subsequently (487) a raid directed on the capital itself. The emperor, to free himself from his troublesome ally, gave him permission to invade Italy, a suggestion gladly adopted by the warlike monarch, who started for Italy in 488; and after forcing his way through the Gepidæ and others who attempted to bar his progress, and gathering recruits on the way, arrived in the summer of 489 on the frontiers of Italy. Odoacer was both forewarned and forearmed; and a desperate conflict between the two powerful armies took place near Aquileia (28th August 489), distinctly to the advantage of the Ostrogoths. A second and more disastrous defeat was inflicted on Odoacer near Verona (27th September), after which he took refuge in Ravenna; but having again gathered a large force, he was totally routed a third time on the banks of the Adda (August 490), again blockaded in Ravenna, while the whole of Italy was being subdued; and having at last surrendered, was treacherously murdered (March 493). T. now assumed the title of *King of Italy*, resisted the claim of suzerainty preferred by the Eastern emperor; and with the exception of a victorious campaign against the Franks, to compel them to cease their assaults on the Visigothic dominions, the suppression of a rebellion in Spain against the authority of the infant monarch, his own grandson Amalric (during whose minority T. administered also the government of the Visigothic kingdom), and an expedition against the robber-hordes of the Bulgarians, the whole of his long reign was devoted to the consolidation and development of his new kingdom. His followers only received one-third of the conquered country; the rest was legally secured to the then possessors, and by degrees his barbarous followers were placed upon a footing of harmony with their fellow-subjects. T. made Ravenna his capital; occasionally, when his northern frontier was threatened, removing to Verona. He died in 526. T. holds the very highest rank among monarchs. An uneducated barbarian, and master of a power which even the most formidable of his neighbours, the Franks, could not have long withstood, he shewed no desire of conquest; cultivated the friendship and esteem of the surrounding nations; ruled all classes of his subjects with irresistible authority, but with corresponding justice and moderation; zealously promoted agriculture and commerce till Italy again took its old position as the most prosperous country in Europe; and, himself an Arian, exhibited a tolerance of all other sects, which the latter, when their turn for supremacy came, were very far from imitating. The foul blot on his character is the judicial murder of Boëthius (q. v.) and Symmachus, for a supposed connivance with the senator Albinus to restore the authority of the Eastern emperor in Italy; but every fact that can be gathered respecting this event bears out the belief that it was the result of a burst of passion, intensified by his extreme, nay, almost morbid, jealousy of Byzantine interference in Italy. The one great error of his administration consisted in his wholly neglecting to assimilate his Ostrogothic subjects with the previous inhabitants, either by a common code of laws, or by common official preferment; for though, under his sway, the evil of this separation did not appear, yet, when the sceptre fell to weaker hands, an antagonism necessarily arose between the ruling and the subject races, which was the chief cause of the successful restoration of Byzantine authority in Italy by Belisarius (q. v.) and Narses (q. v.). T. left no son; but his third daughter, Amalaswintha, succeeded him as regent for her son Athalaric; the eldest, Theodichusa, having become queen of the Visigoths, and the mother of Amalric; and the second, Ostrogotha, the wife of Sigismund, the last king of the Burgundians.

THEODOSIUS, the name of three later Roman emperors.—THEODOSIUS I., surnamed THE GREAT, and THE ELDER, to distinguish him from his grandson, was of Spanish descent, and was born either at Italica (as Gibbon and those who wish to make him of kin with Trajan maintain), or more probably at Cauca, near Segovia, about 346 A. D. His father, also named Theodosius, was the great general of the Roman Empire, who, after freeing South Britain from the savage Caledonians, who roamed over it at their pleasure, and annihilating the formidable rebellion of the Moor Firmus, which threatened to divorce the African provinces from the empire, was conspired against by his many malicious enemies at court, and summarily beheaded at Carthage in 376. T., who had accompanied his father in his British campaigns, and afterwards, by routing the Sarmatians, saved Mœsia from devastation, retired from active service after his father's murder, and occupied himself with the care of his patrimonial lands in Spain. But his many virtues and talents were not forgotten at court; and on the defeat and death of Valens (q. v.), his colleague, Gratianus (q. v.), feeling his inability to sustain alone the cares of empire, summoned T. from his retirement, invested him with the imperial purple, and confided to him, 19th January 379, the administration of Thrace, Dacia, Macedonia, Egypt, and the East, and especially the protection of the empire against the Goths. This last charge called for the full exercise of the new emperor's abilities, for the army at his command dared not face the Goths in the open field; and even when, after the death of their able leader, Fritigern, the Ostrogoths and Visigoths separated, each breaking up into several bands, T. found it most prudent

to sow jealousy and dissension among them by promises and bribes, and after a four years' so-called campaign, succeeded in pacifying the Visigoths, the Ostrogoths retreating towards Scythia. The latter returned in 386, their ranks swelled by Scythians, but were totally routed in attempting to pass the Danube, and the survivors were transported to Phrygia and Lydia. In 387, T. undertook to restore to the throne of the Western Empire Valentinian II. (whose sister, Galla, he married), the brother of Gratian, who had been expelled by Maximus; and after a uniformly successful contest, the usurper was captured and put to death at Aquileia. In 392, the suspicious death of Valentinian, and the elevation of the puppet Eugenius by Arbogastes, the real ruler of the West, again summoned T. to interfere; and after two years of preparation, his motley army of Byzantines, Goths, Alans, and Huns, aided by the treachery of some of Eugenius's generals, gained a complete victory over the Gauls and Germans, who chiefly constituted the army of the West; and the two portions of the Roman Empire were again united under one ruler. The union, however, lasted only four months, owing to the death of T., 17th January 395. T., though a professor of the orthodox Christian faith, was not baptised till 380, and his behaviour after that period stamps him as one of the most cruel and vindictive persecutors who ever wore the purple. His arbitrary establishment of the Nicene faith over the whole empire, the deprivation of civil rights of all apostates from Christianity and of the Eunomians, the sentence of death on the Manicheans and Quarto-decimans (q. v.), all prove this; though the want of evidence for the direct execution of these severe laws, somewhat modifies the unfavourable impression they produce, and inclines us to believe, that, like the massacre at Thessalonica, they were the result of a sudden access of savage passion, carefully fanned by his interested ecclesiastical advisers. His humiliation before St Ambrose, Bishop of Milan, for the massacre at Thessalonica, was regarded by the church as one of its greatest victories over the temporal power. See AMBROSE.—THEODOSIUS II., surnamed THE YOUNGER, the only son and successor of Arcadius (q. v.), was born 401 A.D., succeeded his father when eight years old, and occupied the throne of the East for 42 years. The chief events of his reign were the invasion of the empire by the Huns under Attila, a war with Persia, renewed efforts to extirpate paganism, and the compilation of the *Codex Theodosianus* (see CODE). The emperor himself was the feeblest of rulers, and was much better adapted for the cowl than for the sceptre and sword.

THEO'GONY, the name given in ancient Greece to a class of poems recounting the genealogy of the gods. Musæus (q. v.) is said to have written the earliest Theogony; but his work, as well as the Theogonies of Orpheus (q. v.) and others, have perished; that of Hesiod (q. v.) being the only one that has come down to us.

THEO'LOGY (Gr. *theologia*, lit., a speaking or writing about God) is a term employed to denote the theory of the Divine nature and operation. It first occurs in Plato and Aristotle, who understand by it the doctrine of the Greek gods, and of their relation to the world. Homer, Hesiod, Orpheus, &c., are called *theologoi* (theologians), on account of the subject-matter of their verse. But their theology is at the same time called 'mythic,' to distinguish it from the 'physical' theology of the philosophers, which, reversing the mythic order, concerned itself with speculative inquiries regarding the origin of the world and its relation to the gods. In the New Testament, the word theology does not occur, and the idea seems alien to the simplicity of the primitive Christian faith. The Greek Christians originally designated any deep philosophical apprehension of the truths of religion by the term *Gnosis* (knowledge), which was opposed to *Pistis* (faith), the simple irreflective trust of the majority of humble believers. First during the 3d and 4th centuries the word theology came into use, especially in connection with such of the Fathers as defended the doctrine of the Deity of the Logos. In this sense, the Evangelist John and Gregory of Nazianzen were termed *Theologians*. During the same period, the word theology was applied to the doctrine of the Trinity. In the century following, its application was widened by Theodoret, who used it to denote the whole circle of theoretical instruction in religion; and finally, Abelard, through his *Theologia Christiana*, gave the word that comprehensive signification it still bears, as expressive not only of a theoretical but also a practical exposition of religious truth. The word Divinity is sometimes used to denote the same thing as theology.

THEO'PHILUS, one of the most important precursors of Dr Faust, was, according to the legend, coadjutor-bishop at Adana, in Cilicia. After the death of his bishop, being unanimously chosen successor, he declined the proffered honour, but was shortly afterwards, at the instigation of slanderers, deposed from his former office by the new bishop. He now had recourse to a Jew magician, who took him to a midnight meeting of devils, whose chief ordered him to deny Christ and Mary, and to give a bond, making over his soul. The result was, that next morning he was reinstated in his office and dignities by the bishop; and now, presuming on the support of his confederates, he began to assume a supercilious and domineering manner. But he was soon overtaken with remorse, and, through forty days' fasting and prayers, prevailed on Mary to intercede with her son for him, and to get back the letter from the devil, which she laid upon the breast of the repentant sinner, as he lay asleep in the church. T. then made a public confession of his crime, told of the goodness of the Virgin Mary, and died three days after. This legend, whose origin is traced back to an unknown Greek, of the name of Eutychianus, was brought, during the 10th c., through an equally unknown Neapolitan priest, named Paulus, to the West, where it very quickly spread far and wide. Before the end of the century, it was put into Latin verse by Roswitha, and still better, by the Bishop of Rennes, who died in 1123 (printed in the *Acta Sanctorum*, February 4; and in *Hildeberti Turonensis et Marbodi Opera*, published by Beaugendre, Par. 1708). Gauthier de Coinsy (died after 1236) turned it into a beautiful French poem (printed in *Œuvres de Rutebeuf*, published by Jubinal, 2 vols.); and the Rhenish compiler of the *Alte Passional* admitted it among his legends of Mary (*Marienlegenden*, published by Pfeiffer, Stuttg. 1846). A Dutch metrical version, in the 14th c., was published by Blommaert (*Theophilus*, Ghent, 1836). The first dramatic handling of the subject was in French by Rutebeuf, a distinguished troubadour of the 13th c. (*Œuvres*, published by Jubinal, 2 vols., Par. 1839); then repeatedly during the 14th and 15th centuries in Low-German (*Romantische und andere Gedichte in altplattdeutscher Sprache*, published by Bruns, Berl. and Stettin, 1798; *Theophilus, in Icelandic, Low-German, and other Tongues*, by Dasent, Lond. 1845). The legend of T. is also not seldom to be found inserted in large works, and frequent allusions to it occur in Latin, German, Anglo-Saxon, Icelandic, Swedish, French, and even Spanish literature. It has even

been pictorially represented in French churches. With the 16th c., it seems to have disappeared. However much the various versions differ from one another in the minor circumstances, the essential traits remain throughout unchanged; that T. made a compact with the devil in order to recover lost property; that he attained his object, but at the same time nothing more (nothing whatever of magic art), and that Mary rescued the repentant sinner. Through this legend of T., the oldest known instance of a compact with the devil, there runs a lenient spirit (derived from paganism, and which the Roman Catholic Church was able to sanction by interposing the Virgin Mary), which distinguishes it markedly and essentially from the stern Protestant shape of the devil's compact in the Faust-book, which, with rigorous consistency, requires the consignment of the contracting party to hell.

THEOPHRA'STUS, the Greek moralist and naturalist, was born at Eresus, in Lesbos, and studied philosophy at Athens, first under Plato, and subsequently under Aristotle. The latter took especial interest in him, and according to a rather incredible legend, altered his original name of Tyrtamus into that of Theophrastus (divine speaker), in compliment to the fluent and graceful speech of his pupil. To T., moreover, he bequeathed the presidency of the Lyceum, his library, and the original MSS. of his writings. T. proved a worthy successor of the Stagirite. Under his presidency, the Lyceum sustained its character, and attracted no fewer than 2000 disciples, among whom was the comic poet Menander. The kings Philippus, Cassander, and Ptolemy held him in high esteem; and such was the admiration of the people of Athens for him, that, when he was arraigned for impiety and triumphantly acquitted, they would have killed his accuser, had he not generously interceded. In compliance, however, with the law of Sophocles, which decreed the banishment of all philosophers from Athens, T., in 305 B.C., left the city, until the enactment was repealed the very next year by Philo, also a disciple of Aristotle. From that date, T. continued his lectures until his death in 287, at which time he had presided over the Academy for 35 years. His birth being unknown, we are ignorant of his age at the time of his death, and conjectures variously give it from 85 to 107 years. On the eve of dissolution, he is said to have complained of the shortness of human life, which ended just when he was about to solve its enigmas. He was accompanied to the grave by the entire Athenian population. He bequeathed his library to Neleus of Scepsis. The great object of his philosophical labours was to develop the Aristotelian system, to explain the difficulties which obscured it, and to fill up the gaps which left it incomplete. Most of the works which he wrote with this object have perished; only the following remain: 1. *Characteres*, in 30 chapters, descriptive of vicious characters; 2. *Of Sensuous Perception and its Objects*; 3. A fragment on *Metaphysics*; 4. *Of the History of Plants*, in 10 books, one of the earliest of extant treatises on botany; 5. *Of the Causes of Plants*, in 8 books, of which, however, only 6 remain; 6. *Of Stones*. The best complete edition of T. is that of Schneider; the best edition of the *Characteres* separately is that of Ast.

THE'ORY, a word expressing the scientific process of generalisation under various aspects.

Theory is, in the first place, opposed to Fact, or matter of fact, and signifies that a certain class of facts have been generalised and brought into a single comprehensive statement. It thus corresponds to a Principle, general truth, or Law of Nature. That a half-inflated bladder hung before the fire is expanded till it bursts, is a matter of fact; that bodies generally are expanded by heat, is the theory or general principle, comprehending the whole class of facts. To give the theory of a fact, in this sense of the word, is to give its general law; this is also called its Explanation, and sometimes its Cause. See CAUSE.

Theory, in the next place, is opposed to Hypothesis (q. v.). A fact may, for a time, be referred to a hypothetical or assumed principle; endeavours being meanwhile made to remove the hypothetical character, by proving or disproving the principle. The vortices of Descartes was a hypothesis to account for planetary motions; while Newton's view, that gravity might be the cause of these motions, was, in the first instance, a hypothesis. The Cartesian doctrine was disproved and abandoned; the Newtonian was fully verified, and, ceasing to be a hypothesis, became a theory.

Lastly, Theory is opposed to Practice. The Theory of a subject is the knowledge or explanation of it; the Practice is making some use of it. Physiology is Theory; Physic, or Medicine, is practice. In practical matters, there are two modes of procedure which are still further illustrative of the distinction now in hand. The knowledge possessed by a worker in any art may be empirical, experimental, rule-of-thumb—that is, it may be gathered by actual experience in the particular operation. The seaman's knowledge of the prognostics of weather, and the cook's art in boiling and roasting, are usually of this kind. On the other hand, the worker's knowledge may be obtained from Theory, in other words, from general principles or laws scientifically ascertained; as when the theory of the winds and the law of storms are employed to predict the weather; when the cook roasts and boils according to the known temperature for coagulating albumen; and when a physician prescribes a dietary grounded on a chemical analysis of the food and of the tissues to be maintained. Great caution is required in the employment of such theoretical knowledge in the arts and in practical affairs. It is not enough that the theories are fully established; we must also know all the conditions of the case, so as to allow for every agent operating to produce or to mar the effect. That a cannon-ball should describe a parabola, is a correct theoretical inference from gravity and the laws of motion; but the resistance of the air, a distinct agency, makes it untrue in fact, and therefore misguiding in practice. When this resistance is allowed for, the theory is complete, and its application will no longer disappoint the operator. See DEDUCTION.

THEO'SOPHY (Gr. *theosophia*, divine wisdom), the name given to a so-called sacred science, which holds a place distinct as well from that of philosophy as from that of theology, even in questions where these latter sciences have the same object with it, namely, the nature and attributes of God. In investigating the divine nature and attributes, philosophy proceeds entirely by the dialectic method, employing as the basis of its investigation the ideas derived from natural reason; theology, still employing the same method, superadds to the principles of natural reason those derived from authority and revelation. Theosophy, on the contrary, professes to exclude all dialectical process, and to derive its knowledge of God from direct and immediate intuition and contemplation, or from the immediate communications of God himself. Theosophy, therefore, so far as regards the science of God, is but another name for MYSTICISM (q. v.), although the latter name implies much more and the direct and immediate knowledge or intuition of God, to which the Mystics laid claim, was, in fact,

the foundation of that intimate union with God, and consequent abstraction from outer things, which they made the basis of their moral and ascetical system. The theosophic system dates from a very high antiquity; and within the Christian period we may number among Theosophs, the Neo-Platonists, especially Plotinus, Iamblichus, and Proclus; the Hesychasts of the Greek Church; all those of the medieval Mystics who laid claim to any dogmatical theory; and in later times, the Paracelsists, Bodenstein and Thalhauser, Weizel, Jacob Böhme, and above all, Emmanuel Swedenborg. If we consider one particular view of the philosophic system of Schelling, he also may be assigned to the same school.

THERAPEU'TÆ, a pious 'Jewish' sect, mentioned in a book ascribed to Philo, as living chiefly on the Lake Mareotis, near Alexandria, but as having also numerous colonies in other parts of the world. They are described as in many respects like the Essenes (q. v.). Like them, they lived unmarried in a kind of monastery, were very moderate with regard to food and dress, the latter consisting in a white garment; prayed at sunrise, their face turned to the sun; studied much in the Scriptures—which they explained allegorically—and in other 'ancient books,' and were principally opposed to slavery. The chief differences between these two 'sects,' as they are described to us, consisted in the T. simply living a life of contemplation, while the Essenes followed many occupations, such as agriculture, arts, &c.; the latter lived together, while the T. lived separately in their cells; the Essenes not only took an interest in other human beings, but actively assisted them; while the T., who also, before they entered the brotherhood, divided their property among their relatives, contrary to the 'common treasure' of the Essenes, kept in utter ignorance of the outer world. Again, the T. knew none of the divisions which marked the degrees of initiation among the Essenes, but they held the Temple at Jerusalem in much higher veneration than the latter; the T. brought up boys to the brotherhood, while the Essenes only recruited themselves from grown-up people. One of the chief characteristics of the T. was also the religious meals they used to hold in common on every seventh Sabbath; the Essenes having two such sacred meals daily. Many and striking are also the analogies offered by their mode of life and their doctrines to those of the Pythagoreans. Neither partook, e. g., of animal food or wine, and both admitted women to their assemblies, which were mostly concluded with hymns; and they both held the number seven sacred. Many theories have been broached regarding this mysterious sect. One of the most plausible notions is the one—latterly much discussed—of the whole book *De Vita Contemplativa*, which treats of this sect, being falsely attributed to Philo. It is rather believed to be the work of an early Christian, intended to idealise the life of Christian monasticism and asceticism of the first centuries. See ESSENES.

THERAPEU'TICS (Gr. *therapeuo*, I heal) is that division of the science of medicine which treats of the various actions of remedies upon the diseased animal system, or the means by which nature may be aided in her return to health.

THERAPI'A, or TARAPIA, a village of European Turkey, province of Rumili, is situated on the Bosporus, 21 miles north-north-east of Constantinople, at the head of a large and beautiful bay of the same name. It is one of the most charmingly picturesque spots in the neighbourhood of the Turkish capital, and all summer has a climate deliciously cool. T. is the residence of the French and English embassies, and many of the Frankish merchants have villas here.

THERAPO'NIDÆ, a family of acanthopterous fishes, allied to *Percidæ*, from which they are distinguished by having 6 instead of 7 branchiostegal rays. The scales in some are ctenoid, in others cycloid. Some are fresh-water fishes. None are British. Some are found in the lakes and rivers of North America.

THERESIO'PEL, more commonly called MARIA-THERESIOPEL (Ger. *Theresienstadt*), an important town of the Servian Wojwodschaft, 24 miles west-south-west of Szegedin, on the Palitsch Lake. It is well built, but unpaved; contains numerous important buildings, as the churches, gymnasium, and the great barracks. Manufactures of leather and shoes, linen-weaving, dyeing, the cultivation of tobacco and fruits, together with the rearing of cattle, are the chief branches of industry. Pop. 53,499.

THERI'ACA (Gr. *ther*, a wild or a venomous animal), a medicine in the form of an electuary, supposed to be an antidote to the poison of venomous animals. It was invented by Andromachus of Crete, physician to the Emperor Nero, and was described in a poem, preserved in Galen's work, *De Antidotis*. This theriac was a mishmash of about 70 ingredients, some of them quite inert, and others antagonistic to one another. Yet it continued in repute until recent times, and it is not long since in Venice, Holland, France, and other places, the druggists had to prepare the compound with certain solemnities in the presence of the magistrates. The term theriaca was applied to various compounds of a similar nature, and *theriac* and *theriacal* became synonymous with medicinal. The English word *treacle* is a corruption of *theriacal*, and originally meant an electuary, or compound syrupy medicine (e. g., Venice treacle = the theriac of Andromachus); and it was applied to molasses from the similarity in appearance.

THE'RMIDOR, i. e., the 'Hot Month,' formed, in the calendar of the first French Republic, the 11th month, and lasted from the 19th July to the 18th August. The 9th Thermidor of the Republican year 2 (July 27, 1794) is historically memorable as the date of Robespierre's fall, and the termination of the Reign of Terror. The name Thermidorians was given to all those who took part in this fortunate *coup d'état*, but more particularly to those who were desirous of restoring the monarchy.

THERMO-DYNAMICS, or the DYNAMICAL THEORY OF HEAT. See SUPP. in Vol. X.

THERMO-ELECTRI'CITY treats of the currents that arise from heating the junction of two heterogeneous conductors. Such currents can be obtained in many ways, but we shall here simply indicate the more important.

Thermal Currents with one Metal.—Take a copper wire, cut it in two, and fix each half in one of the binding screws of a galvanometer. Heat one of the free ends to redness, and press it against the other, and a current will be generated, passing at the junction from the hot to the cold end, as shewn by the deflecting needle. In almost all cases where portions of the same metal at different temperatures are pressed together a current is produced, the direction of which depends on the metal, and even on the structure of the same metal.

Currents are also obtained when two portions of the same metal or piece of metal have different structures, and the point where the two structures meet is heated. If, for instance, one piece of wire be hard-drawn and the other part annealed, when

the seat of change from the one to the other is neated, a current is produced. Or if the whole be annealed, and one part of it be hammered, the hammering makes the other part harder, and the current, when the junction is heated, passes from the soft to the hard part. The direction of the current differs with different metals in these circumstances. Even the difference of structure introduced by the twisting of a portion of a wire, causes a current to flow when the wire is heated in the vicinity of the twist. Thus, when a knot is tied on a platinum wire, or when part of it is coiled into a spiral, a current passes always towards the knot or coil when the flame of a spirit-lamp is directed on a portion of the wire near the knot or spiral. The twisting, in this case, acts as hardening or hammering would do. By running the flame of a spirit-lamp along a metal, it frequently happens, more especially if it be of a crystalline structure, that currents are produced at certain points. These points are supposed to indicate a change in structure. If a bar of fused antimony have its ends connected with a galvanometer, and examined in this way, *neutral points* are generally found. The flame of a lamp generates a current near these points, always passing towards the point, and changing in direction with the change of the side on which the flame is applied. Bismuth shews neutral points, but the current always goes from the cold to the hot part across the neutral point. In bars of those metals which are crystallised regularly and slowly, no neutral points are found.

Thermal Currents with two Metals.—A current is always obtained when the point of junction of any two metals is heated. The two metals which shew this property in the greatest degree are bismuth and antimony. When a bar of antimony, A (fig. 1), is soldered to a bar of bismuth, B, and their free extremities are connected with a galvanometer, G, on the junction being heated, a current passes from the bismuth to the antimony, as shewn in the figure. When S is chilled by applying ice, or otherwise, a current is also produced, but in the opposite direction. Such a combination constitutes a thermo-electric pair. Applying the same mode of explanation to this pair that we apply to the galvanic pair (see GALVANISM), bismuth is positive within and negative without the pair, antimony negative within and positive without the pair. Bismuth thus forms the negative pole, but positive element; antimony the positive pole, but negative element of the pair. The metals may be classed in thermo-electric just as in electro-chemical order. The following table gives them in this order, the direction of the arrow shewing how the current goes within the pair:

Fig. 1.

HEAT. →

Bismuth,	35
Cobalt,	[illegible]
Potassium,	5·5
German Silver,	5·2
Nickel,	5
Sodium,	3
Mercury,	2·5
Aluminium,	1·3
Magnesium,	1·2
Lead,	1·03
Tin,	1
Copper,	1
Platinum,	·7
Silver,	0
Gas Coke,	—·05
Zinc,	—·2
Iron,	—5
Antimony,	—10
Tellurium,	—179

← COLD.

he order and numbers in this table, which are for emperatures between 40° and 100° F., are those given by Dr Mathiessen. For other temperatures the table would be different for several of the metals.

It will be seen, that metals like bismuth and antimony, which have a crystalline structure, are best suited for a thermo-electric pair. Tourmaline, when heated, shews an opposite electricity at each end. If it had a low conducting power like the metals just named, we might expect from it a thermo-electric current instead of mere polarity. It is probable that the crystalline structure, however, accounts for the appearance of electricity in both cases.

Thermo-electric Pile or Battery.—One bismuth-antimony pair is of very little power. To increase this, several pairs are associated together, as shewn in fig. 2, where the same tension-arrangement is adopted as in a galvanic battery. The heat in this case must be applied only to one row of soldered faces. The current depends on the difference of temperature of the two sides. When a strong current is required, the one series must be kept in ice, or in a freezing mixture, whilst the other is exposed to heat radiating from a red-hot plate of iron. As in the galvanic pair, the electro-motive force is proportionate to the number of pairs; the size of the bars, like the size of the galvanic plates, merely aiding to diminish the resistance. The electro-motive force of a thermo-electric battery is small; according to Dr Mathiessen, that of 25 bismuth-tellurium pairs equals one cell of Daniell's battery, when the one series is kept at 32° F. and the other at 212° F. In consequence of the low electro-motive force of the thermo-electric battery, the galvanometer to be used with it must introduce as little resistance as is consistent with the best effect on the needle. Hence special galvanometers are used, in which the coil wire is short (200 turns) and thick ($\frac{1}{15}$ inch); these are called thermo-galvanometers.

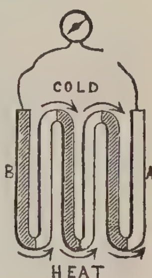


Fig. 2.

When a great number of pairs are formed into a battery, they may be conveniently arranged as in fig. 3, which shews one of 30 pairs. The odd faces, 1, 3, 5, &c., are exposed on the one side, and the even faces, 2, 4, 6, &c., on the other. The terminal bars are connected with the binding screws *n*, *p*. The interstices of the bars are filled with insulating matter (gypsum) to keep them separate, and the frame in which the whole is placed is of non-conducting matter. Such a pile in conjunction with a thermo-galvanometer (see GALVANISM) forms the most delicate thermometer for radiant heat, and is generally called a *thermo-multiplier.* When placed in a room, the temperature of which is equable all round, no current is produced; but if heat be radiated more on one side than another, a current ensues. If the hand, for instance, be brought near on the one side, a current indicates its radiant power; or if a piece of ice be brought near, a current is also shewn, but moving in the opposite way.

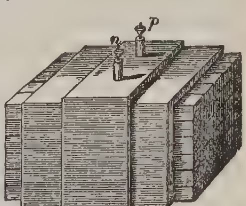


Fig. 3.

Thermal Effects produced by the Galvanic Current.—As heat or cold produces a current at the

junction of two dissimilar conductors, we should expect that if a galvanic current be made to pass through the junction, heat or cold would follow, and such is found to be the fact. When a current from a voltaic cell passes, as shewn in fig. 4, through a system of three rods of bismuth, antimony, and bismuth, at the junction where the current passes from bismuth to antimony, cold is produced; and at the other, from antimony to bismuth, heat. If, for instance, water be placed in a hollow at either junction, cooled to 32° F., it will become frozen when the current passes from the bismuth to the antimony. When the junction of these two metals is put into the bulb of an air thermometer, so that a current can be sent through it in either way, the air expands when the current goes from antimony to bismuth, but contracts when it goes in the opposite way. Powerful currents must not be used, otherwise heat will be produced at all the junctions. Seebeck was the discoverer (1821) of thermo-electricity; Nobili invented the thermo-electric pile (1834); Peltier (1834) first observed the thermal effects of galvanic currents at the junction of heterogeneous conductors. See also T.-E. and T.-MAGNETISM in SUPPLEMENT in Vol. X.

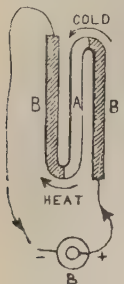


Fig. 4.

THERMO'METER (Gr. literally *heat-measurer*), a term which, in spite of its derivation, is usually restricted to instruments which measure temperature (see HEAT) by the *expansion* of bodies. Like that of the telescope and microscope, and many other valuable pieces of philosophical apparatus, its early history is very obscure. There are various claimants who seek to share at least a part in the credit of its invention; and they agree pretty well in referring it to somewhere in the beginning of the 17th century. We shall not waste space in endeavouring to settle such matters of history, but proceed at once to a description of the forms of the instrument now most commonly used; after which we shall say a few words about the actual value of their indications, and finish by a rapid sketch of a few other instruments also adapted for the measurement of temperature, but not usually known by the name of thermometer.

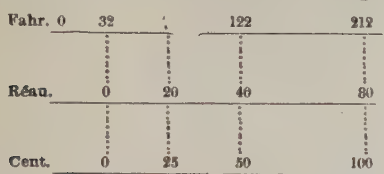
Let us commence with the ordinary spirit-thermometer, as it is called; where the indications are given by the expansion of a quantity of alcohol which fills entirely a glass bulb, and partially a narrow tube attached to it.

To construct such an instrument, a capillary tube is selected, of as uniform a bore as possible. The easiest method of testing its uniformity is to introduce a column of mercury, about an inch long, into the tube, and gradually move it along by inclining the tube, carefully measuring the length of the column in each of its successive positions. It is obvious that the column will be longer the smaller is the mean section of the portion of the tube occupied at any time by the drop of mercury. If considerable differences of length are found, the tube is rejected at once. The best tubes are those which, if shewing any change, taper very slowly but nearly uniformly from one extremity to the other; a defect which can easily be allowed for in the subsequent graduation of the instrument. A bulb is blown on one end of the selected tube; large, if the instrument is meant to be very delicate; small, if a common instrument is to be made, or one which will work through a great range of temperature. The bulb is heated to expand the contained air, and then the open end of the tube is plunged into alcohol, usually tinged with colouring matter, for greater visibility. As the bulb cools, the atmospheric pressure on the alcohol in the vessel forces some of it into the stem, and perhaps a little into the bulb. The tube being then inverted, a few dexterous taps suffice to shake the greater part of the alcohol into the bulb. The lamp is again applied, with caution, until the alcohol boils, and the rapidly escaping vapour drives the air almost entirely from the tube, whose open end is immediately plunged again into the coloured spirit. Unless the stem be nearly 40 feet in length—and thermometers have been made by Forbes (q. v.) of a length approaching to this for the measurement of underground temperature—the alcohol fills the whole of the ball and stem as soon as the glass has cooled. The bulb is again cautiously heated so that, by the expansion of the spirit, such a portion may be expelled, that when the whole has again cooled, the level of the liquid in the tube may stand near some point previously determined on with reference to the particular employment for which the instrument is destined. Finally, the lamp being again applied to the tube, near the upper surface of the liquid, that portion of the spirit is again made to boil; and while the vapour keeps the free end of the tube clear of air, that end is hermetically sealed; and the glass-blower's part of the work is done. A somewhat similar, but more difficult process has to be gone through if other liquids, such as ether, sulphuric acid, mercury, &c., are employed to fill the bulb; each of these liquids having its own special use in certain philosophical inquiries, as we shall presently see. It only remains that the instrument be *graduated*, so that some definite information may be given by its indications.

In the older thermometers, the scale was arbitrary, so that no comparable readings could be taken by means of different instruments. In the finest modern instruments, also, the scale is usually quite arbitrary, being, in fact, engraved on the tube during the process of calibration above described. But then, by careful observation, certain definite temperatures are measured in terms of this arbitrary scale, so that the value of a degree and the position of some definite zero-point are determined for it, and the result engraved on the tube. These numbers enable us, by an easy calculation, to reduce the observed reading of the fine instrument to its equivalent in some of the standard scales.

At present, we assume, what is very nearly true for mercury at least, that equal increments of bulk correspond to equal increments of temperature. All, then, that is necessary is to fix two definite temperatures, and assign their positions on our scale. Water being one of the most common bodies in nature, and being everywhere easily obtainable in a state of great purity, is usually employed; and its *freezing* and *boiling* points are taken as the definite points. The temperature of freezing water or of melting ice is almost absolutely fixed, for (see HEAT) pressure alters it only very slightly. It is otherwise with the boiling-point of pure water, for this is considerably raised by increase of pressure; so much so, in fact, that if the barometer be not attended to, an error of several degrees is possible. Hence we must define the particular pressure, usually 30 inches, at which the boiling-point is to be determined. The thermometer, constructed (so far) as above described is to have its bulb, and nearly the whole of the portion of the stem which contains liquid, immersed in pounded ice, from which the melted portion is freely trickling; and when the level of the spirit has become stationary, its position, the *freezing-point*, is marked on the tube. Similarly, the barometer standing at 30 inches, the bulb is enclosed in the

steam immediately above the surface of water freely boiling. We thus obtain the *boiling-point.* It only remains that we decide by what numbers these points shall be indicated, because (on account of the nearly uniform expansion of mercury) then the remaining divisions can be at once filled in by dividing the interval between them into equal parts, or, if necessary, allowing for a slight taper in the tube. The only scales which require mention are those of Fahrenheit, Réaumur, and Celsius. Of these, the first is commonly used in Britain, the second in Germany, and the third in France; but this last, under the name of the *Centigrade* scale, is almost exclusively used by scientific men of all nations. The relations of these scales will be easily understood by means of the following figure:



In the Fahrenheit scale, the freezing-point is 32°, and the boiling-point 212°, so that the space between these is divided into 212 − 32, or 180, equal parts or degrees. In the others, the freezing-point is the zero, but the boiling-point is 80° and 100° respectively. It is of course perfectly easy to reduce from one of these scales to another. Thus—What is the Centigrade reading for 77° F.? (see the dotted line in the figure). The numbers in Fahrenheit's scale are all too great by 32, because 32°, and not 0°, stands for the freezing-point. Subtract this from 77, and we have 45. Hence the required number of Centigrade degrees must bear the same ratio to the 100 from freezing to boiling in that scale that the 45 bears to the 180 degrees between the same limits in Fahrenheit's. The requisite number is therefore $\frac{45}{180}100 = 25°$ C. In words—*To convert Fahrenheit to Centigrade, subtract* 32, *and multiply by* $\frac{100}{180}$, *or* $\frac{5}{9}$. Vice versâ—*To pass from Centigrade to Fahrenheit, multiply by* $\frac{9}{5}$, *and add* 32. Thus the Fahrenheit value of 50 C. is $\frac{9}{5}50 + 32 = 122$, as in the figure. Of course the similar processes with Réaumur's scale present no difficulty.

It is supposed that Fahrenheit fixed his zero at the point of greatest cold that he had observed, possibly in Iceland, more probably by means of a freezing mixture, such as snow and salt, or sal-ammoniac. It is much to be desired that the Centigrade scale alone were employed.

A mercurial thermometer ceases to be of use for temperatures only a little above the freezing-point of mercury; but it has a wide range upwards, as mercury does not boil till about 600° C. On the other hand, a spirit-thermometer, though of little use beyond about 50° or 60° C., as alcohol boils at 70° C., is useful for any degree of cold yet produced, as alcohol has never yet been frozen. When extreme sensitiveness is required, ether being considerably more expansible than alcohol, is sometimes employed; as by Thomson in detecting the effect of pressure on the freezing-point of water. Water, again, would be about the very worst substance with which a thermometer could be filled; for not to speak of its expanding in the act of freezing, and therefore necessarily bursting the instrument, if it were ever allowed to reach the freezing-point, its scale would read partly backwards and partly forwards; for as ice-cold water is gradually heated up to 4° C. it contracts, and begins to expand again after that limit has been passed.

To make thermometers self-recording, various schemes have been proposed, of which we shall notice only one or two. Those most commonly used indicate only the *maximum* and the *minimum* temperature during each 24 hours, or during the interval which has elapsed since they were last set. The usual arrangement consists of two thermometers, a mercurial and a spirit one, fixed horizontally to the same frame, with their bulbs at opposite ends of the frame. Above the mercury is a small piece of steel or ivory, and *in* the spirit a small and light float of glass or enamel. As the mercury expands, it pushes the steel before it, and when it again contracts it leaves it behind; the end nearest the mercury thus remaining at the highest or maximum indication which that thermometer has given. In the spirit-thermometer, the liquid, as it expands, freely passes the enamel, and leaves it undisturbed; but it can never contract so as to leave it dry. It therefore pulls the enamel back when it contracts, and thus the extremity farthest from the bulb marks the lowest point which the spirit has reached, or the minimum temperature. To set this instrument, incline it so that the steel falls back to the surface of the mercury—the enamel at the same time comes to the surface of the spirit. The registering thermometers of Negretti and Zamba are the most esteemed. Walferdin's maximum is ingenious.

The best mode of registration is undoubtedly the photographic. For this purpose, a mercurial thermometer is placed vertically before a narrow slit, in such a way that no light can pass through the slit save above the level of the mercury in the tube. A gas flame is kept burning at some distance in front of the slit, the bulb of the thermometer being protected from its radiation; and behind the slit, a sheet of prepared photographic paper is exposed to the narrow line of light which passes above the mercury. This paper is fixed on a cylinder with a vertical axis, which is made to revolve uniformly by clockwork. Lines are drawn by the clockwork on the paper, giving the position of the slit at each hour of the 24, or the gas-flame is mechanically reduced or eclipsed at intervals of an hour; so that the record, when photographically developed, gives the temperature for every minute of the day and night, in a form represented below; where the blackened

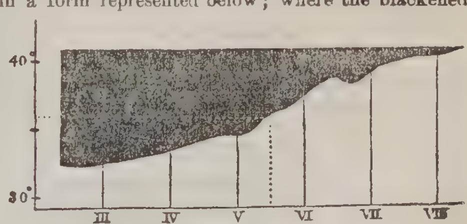


Fig. 1.

space represents the portion of the paper which has been exposed to the light. To find from such a record what was the temperature at any hour, say, 5 hours 30 minutes A.M., draw a vertical (dotted) line, as in the figure, half-way between the V and VI lines, and from the point where it meets the dark space, draw a horizontal (dotted) line. This intersects the scale (to the left in the figure) at 36°, the temperature required.

Among ordinary meteorological instruments, the *wet-bulb* thermometer is deserving of notice. It is simply an ordinary thermometer, with the bulb

covered with paper or cotton-wool, kept constantly moist by the capillary action of a few fibres connecting it with a small vessel of water. If the air be *saturated* with moisture (see DEW, EVAPORATION), there will be no evaporation, and the wet-bulb thermometer will give the same indication as the dry-bulb. But the drier and the warmer the air is, the faster does the water evaporate, and (the latent heat of vaporisation being mainly taken from the moist bulb) the lower does the mercury sink in the moist-bulb instrument. The difference between the readings of the two instruments, compared with the actual temperature, as shewn by the dry-bulb, thus leads to a determination of the hygrometric state of the air.

So far, we have spoken of the instruments now in common use. But the *air*-thermometer was probably the oldest form; and possesses a scientific superiority over those just described. Theoretical and experimental investigations, connected with the modern Dynamical Theory of Heat (see FORCE, HEAT), shew that equal increments of heat produce almost exactly equal changes of bulk in a nearly perfect gas, such as air, if the pressure to which it is exposed be constant. Hence, temperature, as measured by an air-thermometer, gives a true indication of the quantity of energy present in the form of heat. As the comparison of an air-thermometer with a mercurial one shews that, for temperatures not greater than 300° C., or 572° F., the indications of the two agree very closely, the ordinary mercurial thermometer practically possesses within these limits the same advantage.

As the pressure of a gas depends on the amount of heat it contains, the *absolute zero* of temperature, or the temperature of a body wholly deprived of heat, may be determined by finding the temperature at which a perfect gas would cease to exert pressure. For ordinary temperatures, it is found (see HEAT) that air increases in bulk by ·3665, and hydrogen by ·3668 of its bulk, when heated under constant pressure from 0° to 100° C. Again, by Boyle's law, if the air be compressed again, at constant temperature 100° C., to the bulk it had at 0° C., its pressure is increased by ·3665 of its former amount. Thus, p_0 being the pressure at temperature 0° C., p_t that at $t°$ C., we have, when the volume is kept constant,

$$p_t = p_0(1 + \cdot003665t).$$

If we assume this to hold for all temperatures, p_t vanishes when

$$1 + \cdot003665t = 0;$$
$$\text{or } t° = -274° \text{ C. very nearly.}$$

That is to say, at 274° C. under the freezing-point of water, a perfect gas ceases to exert pressure on its containing vessel—i. e., is deprived of that thermal energy on which pressure depends.

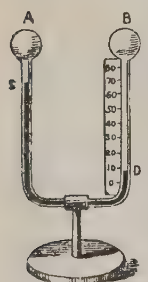


Fig. 2.

The air-thermometers in common use are affected by the pressure, as well as the temperature, of the atmosphere. To avoid this inconvenience, Leslie and Rumford in the present century revived the *Differential Thermometer* of Sturmius. This instrument, in one of its many forms, is represented in fig. 2. Here a bulb is blown at *each* end of the tube (which is bent into a U-form), and the liquid in the stem is used merely as an index, both balls being full of air. The length of the column of fluid is usually adjusted so that it can just fill one of the vertical arms and the horizontal portion of the tube; and the quantities of air in the two balls are so adjusted, that the column will take this position *when the two balls are at the same temperature.* If the ball A be heated more than B, the liquid index will take a new position, such as CD, and this is read off by a scale applied to either of the vertical arms. The graduation of this instrument may be effected by calculation, but it is usually done experimentally. Leslie made good use of it in his investigations on heat; and, with various adjuncts, such as colouring the glass of the ball A, while that of B was left white; silvering or gilding one of the balls; covering one of them with moist silk or linen, &c., this instrument became in his hands a *Photometer*, an *Æthrioscope*, a *Hygrometer*, &c.

To thermometers which depend for their action on the expansion of solids, the name PYROMETER (q. v.) is frequently given; but that of Bréguet, as delicate as a good ordinary mercurial thermometer, is not alluded to in that article. The principle of this very beautiful instrument may easily be explained thus. In bending a slip of wood, the fibres on the convex side are necessarily more extended than those towards the concave side. Conversely, if the fibres on one side of a slip of wood were to expand more than those on the other, the slip would bend. Bréguet solders together two thin strips of gold and platinum, or platinum and silver; for portability and concentration bends the compound strip into a helix, fixes its upper end, and attaches a horizontal index to the lower end. The least change of temperature in the surrounding air changes the length of one side of the compound slip more than the other, and the helix twists or untwists through an angle very nearly proportional to the change of temperature.

For measuring radiant heat, the most delicate instrument is the thermo-multiplier. See THERMO-ELECTRICITY.

THERMO'PYLÆ (literally, 'the hot gates'), a famous pass leading from Thessaly into Locris, and the only road by which an invading army can penetrate from northern into southern Greece. It lies south of the present course of the river Spercheius, between Mount Œta and what was anciently an impassable morass bordering on the Maliac Gulf. In the pass are several hot springs, from which T. probably received the first part of its name. T. has won an eternal celebrity as the scene of the heroic death of Leonidas (q. v.) and his 300 Spartans in their attempt to stem the tide of Persian invasion (480 B.C.). Again, in 279 B.C., Brennus, at the head of a Gallic host, succeeded, through the same treachery that had secured a victory to Xerxes, in forcing the united Greeks to withdraw from the pass.

THERSI'TÉS, son of Agrius, whom Homer, in the *Iliad*, makes the ugliest and most impudent talker among the Greeks before Troy. His name in antiquity was a synonym for dastardly and malevolent impudence. The later poets say that he was slain by Achilles for calumniating him.

THESAU'RUS. See DICTIONARY.

THE'SEUS, one of the most celebrated personages of the Greek heroic age. The legend of his career is differently told, but he is usually said to have been the son of Ægeus, king of Athens, by Æthra, daughter of Pittheus, king of Troezen. He was brought up at the court of his maternal grandfather, and, on reaching manhood, proceeded to his father's residence at Athens. On his way thither, he performed several famous exploits, such as the destruction of Periphetes, Sinis, Phæa, the Krommyonian sow, Skiron, Kerkyon, and the fell robber Prokrustes. See PROCRUSTES. After his arrival,

Medea sought to poison him, but her plot failed. Ægeus recognised his son, and Medea and the sons of Pallas were banished. The next feats of T. were the capture of the Marathonian bull, and the deliverance of Athens from its dreadful tribute of youths and maidens to the Cretan Minotaur (q. v.), in which he was assisted by the Cretan princess, Ariadne (q. v.). On his return to Athens, his father Ægeus destroyed himself, and T. succeeded to the throne. In his new capacity of ruler, he displayed no less wisdom than he had formerly shewn heroism. To him the legend ascribes the consolidation of the twelve petty commonwealths of Attica into one state, an event that certainly did occur at some period of Attic history, which was commemorated by the festival of the *Synœkia*. T. also reorganised the Athenaic festival, and re-named it the Pan-Athenaic, founded the Isthmian games, and many other institutions; but soon after, the craving for his old stirring life returned, and having laid down his authority, he set out along with Herakles in quest of new adventures. They fought the Amazons, and T. carried off their queen, Antiope or Hippolyte, by whom he had a son. After the death of Antiope, he married Phædra. The legend makes him take part in the Argonautic expedition by a ludicrous anachronism, join in the Calydonian hunt, help Peirithous and the Lapithæ against the Centaurs, and assist in the attempt to rescue Persephone from the lower world (which led to a long imprisonment there, from which he was delivered by Herakles). Returning to Athens, he found that the minds of the people had been prejudiced against him during his absence, and as he could not re-establish his authority, he withdrew to Skyros, where he was treacherously destroyed by King Lykomedes. What grain of historical fact may lie in the myth of T. it is hard to say. One of the most brilliant figures of the heroic age, reminding us, by his valour, wisdom, and generous love of the fair sex, of a knight of chivalry, we are loath to yield him up as a victim to the ravenous maw of criticism; yet all that can be said for his historic reality is, that so finished and admirable a prince is more likely to have been a legendary tradition of some real hero of primeval times, than a mere creature of the poetic imagination.

THE'SIS, a Greek term, strictly signifies a 'placing' or 'setting'—e. g., Pindar's *epeôn thesis* (Ode iii. 14)—the 'arrangement of words' in verse; but subsequently was employed by the philosophers (Aristotle, &c.) to denote an intellectual position that had to be maintained. This is the sense in which the word was understood by the scholastics of the middle ages.

THESMOPHO'RIA, a famous festival anciently celebrated in different parts of Greece, but especially in Attica, in honour of Demeter, as the *Thesmophoros* or 'law-giving' goddess, inasmuch as, by the introduction of agriculture, she gave the first impulse to civil society, and more especially to the honourable bond of marriage. The Thesmophoria lasted three days, from the 11th of the month Pyanepsion (October). Only married women could take part in the ceremonies. After certain preliminary purifications (among which abstinence from sexual intercourse was prominent), the women inaugurated the solemnity by marching in procession from Athens to Eleusis, where the night was spent in celebrating the mysteries of the goddess. The next day, called *nesteia*, or the 'day of fasting,' was spent in mourning. The women sat for a while on the ground around the statue of Demeter, and ate nothing but cakes made of sesame and honey. They next proceeded barefooted to the Thesmophorion or temple of Demeter, where they deposited their mystical offerings to the goddess. On the third day, called *Kalligeneia* in honour of Demeter as the 'mother of beautiful offspring,' fasting was exchanged for merriment, jollity, and raillery.

THES'PIS. See DRAMA.

THESSALO'NIANS, FIRST EPISTLE TO THE, one of the earliest epistles of St Paul—perhaps the very earliest—was probably written at Corinth about the close of the year 52 A. D., and seems to have been occasioned by the 'good tidings' which Timothy brought him of the 'faith and charity' displayed by his Macedonian converts. It may be divided into two portions, a *narrative* and a *hortatory*; the former embracing the first three chapters, and terminating with a prayer for the Thessalonians, the latter the remaining two. From the narrative portion we derive much important and deeply interesting information regarding the 'Church of the Thessalonians;' but perhaps its great value consists in the picture it presents to us of the apostle himself—'bold in God,' yet 'gentle, even as a nurse cherisheth her children;' scorning to use 'flattering words,' or to 'seek glory' from an assertion of his apostolic dignity; nay, in the excess of a noble pride, 'labouring night and day because he would not be chargeable unto any.' The Epistle is conspicuous for the absence of the ordinary doctrinal element; even the word 'justification,' it has been remarked, does not once occur: on the other hand it is penetrated with a deep conviction of the nearness of the second coming of Christ, and with an undefined fear lest, in spite of all his labours, the 'tempter' (probably, in this case, the Hellenistic Jews of Thessalonica) should seduce the Thessalonian Christians from the 'faith.' Schrader (*Apostel Paulus*) was the first to impugn the genuineness of the Epistle. He was followed in the same line by Baur; but their opinions have met with little favour among scholars of any party.—See Lünemann in Meyer's *Commentary*, Jowett's (2d ed. 1859) and Ellicott's (2d ed. 1862) *Commentaries*.

THESSALONIANS, SECOND EPISTLE TO THE, was likewise written at Corinth, and in all probability not long after the first. It is generally thought to have been occasioned by the misapprehension of the apostle's meaning on the subject of the coming of Christ to judgment, to which the previous letter had given rise, although Hug and others consider the expression, 'be not troubled . . . by letter, *as from us*' (chap. ii. 2), as indicating that somebody had forged an epistle in Paul's name; and it is scarcely possible to interpret the passage at the close of the letter, 'The salutation of Paul with mine own hand, which is the token in every epistle: so I write' (chap. iii. 17), otherwise than as a precaution against forgery. From its contents, we gather that adversaries of the apostle had been at work among his Macedonian converts, and that they had not scrupled to misrepresent his teaching, particularly on the great topic above mentioned. Who they were, we cannot be sure, but it is probable that they were Jews or Judaizing Christians. They must have obtained a considerable measure of success in their nefarious enterprise, for we are distinctly aware of a sharper and more imperious tone in the language of Paul. He now teaches more precisely that Christ could not come until the antagonistic forces in human or diabolic society had made themselves more prominent, and done their worst. The genuineness of this Epistle is as certain as that of the first. See the commentaries previously mentioned.

THESSALONI'CA. See SALONIKI.

THESSALY, the largest division of ancient Greece, lay to the south of Macedonia and the east of Epirus, being separated from the latter by Mount Pindus, and from the former by the Cambunian Mountains, the Ægean Sea bounding it on the east, and the Maliac Gulf and Mount Œta on the south. T. proper is a vast plain shut in on every side by mountains; on the N. and W. by those already named, on the S. by Mount Othrys, and on the E. by Mounts Pelion and Ossa, the only opening being the Vale of Tempe in the north-east, between Ossa and Olympus. The plain of T. is said at one time to have been a vast lake, the waters of which found an outlet by the Vale of Tempe. This plain is drained chiefly by the river Peneius (now *Salambria*), which traverses the country in a north-east direction, and its tributaries, and is the most fertile in all Greece, producing in ancient times abundance of corn and cattle, and a breed of horses considered the finest in Greece.

History. T. was originally called Æolia, indicating that the country was at one time inhabited by Æolians, who, however, were either expelled (proceeding south, and taking up their residence in Bœotia, &c.) or reduced to slavery by immigrants from the more rugged region of Epirus about 1000 B.C. As in Laconia, the inhabitants of T. appear to have been divided into three classes—1. There were the Epirote conquerors, who became rich landed proprietors; 2. Those descendants of the original inhabitants, who, although dependent on the nobles, yet possessed a few privileges—corresponding to the Laconian Periœci; and 3. The Penestæ, or those of the original inhabitants who had been reduced to serfdom, and who cultivated the lands of their conquerors, corresponding to the Helots, although, on the whole, their condition was better. These latter frequently rebelled against their masters, who were very frequently at war among themselves. Each of the four districts into which T. proper was divided was regulated by a council of its own, but they were occasionally united under a Tagus or president, whose power and time of office appear to have been indefinite. The government, from an early time, appears to have been oligarchical in the separate cities—of which Pharsalus, Larissa, Heracleum, and Pheræ were the chief—the principal power being in the hands of the two great families of the Aleuads and Scopads, famous for their hospitality and encouragement of poets and artists. T., however, never played any important part in Grecian history, and it was only after the end of the Peloponnesian war that it exercised any influence on the affairs of Greece. About that time (400 B.C.), Lycophron, overthrowing the government of the nobles, became tyrant of Pheræ, and endeavoured to make himself master of all Thessaly. What he failed to accomplish, his successor, Jason, succeeded in doing, causing himself to be elected Tagus of all T. about 374 B.C.; his assassination in 370 B.C. preventing him from attempting to become master of all Greece as he intended. The rule of Jason's successors became so unbearable, that, in 353 B.C., the old families called in the aid of Philip of Macedon, who compelled the 'Tagus' to abdicate; and, in 344, subjected the country to Macedonia, appointing as governors of the four districts members of the old families devoted to his interests. From this time, T. remained subject to the Macedonian kings, till the victory gained over the latter by T. Flaminius at Cynoscephelæ, in 197 B.C., restored it to freedom under the protection of Rome. Under the emperors, T. was united with Macedonia, but in the later constitution of the Roman Empire after Constantine it was a separate province.

THETFORD, a municipal and parliamentary borough and market-town of Norfolk, on the Little Ouse, 95 miles north-north-east of London by the Great Eastern. Malting is carried on to a considerable extent, and there is some trade on the Ouse, which is navigable up to this point. There are remains of a Cluniac priory, and of other religious edifices. The borough was disfranchised by the Reform Bill of 1867. Pop. (1881) 4034.

At T., which is a very ancient town, a synod was held in 669; and two centuries later, in 870, it was taken and sacked by the Danes.

THETIS, daughter of Nereus and Daris, was married against her will by the gods to Peleus, by whom she became the mother of Achilles. She dwelt in the depths of the sea with her father, and had, like Proteus, the power of changing her shape. Her hand is said to have been sought by Poseidon and Zeus, who gave up the pursuit on Themis declaring that the son of T. would be greater than his father.

THIAN-SHAN, or CELESTIAL MOUNTAINS, a great mountain-system, consisting of several ridges, mostly parallel, in Central Asia, are situated to the south and east of Lake Issyk-kul, in lat. about 42° N. They are said to extend in an east-north-east direction from the vicinity of Samarkand, to long. about 96° E.—a distance of 1500 miles. As this range, however, was never visited by any European till P. Semenof, commissioned by the Imperial Russian Geographical Society, explored a part of it in 1858, little has been actually ascertained regarding its character and dimensions. It is one of the four great ranges, trending in a general direction from west to east, which traverse Central Asia—and these respectively are the Altaï-Sayan, or Altaïan Mountains, in lat. about 50° N.; the T. Mountains, lat. about 42° N.; the Kuen-lun system, lat. about 36° N.; and the Himalaya Mountains (q. v.). In long. 76°—79° E., the T. Mountains are divided into two great, nearly parallel ridges, and enclose between them a deep valley, about 15 miles in average breadth, through which the river Narin—the chief head-water of the Sir-Daria—flows in a west-south-west direction. East of these ranges, the mountains are known as the Tengri-Tagh; and of this subdivision, the chief peak is the Tengri-Khan (i. e., Spectre-Prince), in lat. 42° 23′ N., long. 79° 40 E., and which rises to the height of 21,000 feet. East from the Tengri-Tagh, the T. Mountains continue in a double chain, and at an average height of 11,330 feet. In long. 90° E. is the volcano Pe-shan, which is believed to have been in activity prior to the 7th century; and in the vicinity are several other volcanoes. These are remarkable as the only instances of volcanic fires at so great a distance—1500 miles—from the sea. In long. 88° E. is the huge mountain-mass of Bogdo-Oola, perhaps the culminating point of the whole system, and certainly the peak on which there is the greatest accumulation of snow. There are several passes of from 10,000 to 13,000 feet in height.

THICK-KNEE (*Oedicnemus*), a genus of birds of the family *Charadriadæ*, most nearly allied to the plovers, although, from their comparatively large size, they have often been ranked with bustards. They differ from the true plovers in having both mandibles inflated towards the tip, and not merely the upper mandible. There are about half a dozen species. Only one occurs in Britain, the COMMON T. (*O. crepitans*), also known as the Thick-kneed Plover, Thick-kneed Bustard, Great Plover, Norfolk Plover, and Stone Curlew.

THIELT, a town of Belgium, in the province of West Flanders, 16 miles south-south-east of Bruges.

It is a well-built town, containing several interesting edifices and institutions. An important linen market takes place here annually, and the principal manufactures are linen, woollen, and cotton goods, gloves, vinegar, beer, and tobacco. The population numbers about 12,000.

THIERRY, Jacques Nicholas Augustin, an eminent French historian, was born at Blois on the 10th May 1795. He received his education in the normal school of his native town, and became a teacher in a provincial school. In 1814, he resigned this charge, came to Paris, and published his first work, entitled *De la Réorganisation de la Société Européenne*. In this treatise he considers the practicability of having one government for the whole of Europe, preserving at the same time the nationality of each people. Adopting the views of St Simon, T. became the assistant of that philosopher, in which capacity he worked for three years. In 1817, he joined Comte and Dunoyer as editors of the *Censeur Européen*, in which he wrote many articles, literary, political, and historical. In 1820, he became engaged on the *Courrier Français*, in which he published his *Dix Lettres sur l'Histoire de France*. He now began to addict himself almost exclusively to historical writing. Having given up the *Courrier*, he published his masterpiece, *L'Histoire de la Conquête d'Angleterre par les Normands* in 1825, and his *Lettres sur l'Histoire* (1827), works which had great success; but this success was dearly bought, as the necessary labour seems to have ruined the eyesight of the author. Becoming quite blind in 1830, he went in that year to Hyères for the benefit of his health. Here he met Julie de Quérengal, an authoress of considerable repute, whom he married in the following year. He seems to have been able partially to resume work about this time, and in 1835 he published his *Dix Ans d'Etudes Historiques*, the introduction to which is one of the most eloquent of his works. In 1840 appeared his *Récits des Temps Mérovingiens*, which work gained the great Gobert prize. The preface gives an interesting and eloquent account of the history of his own literary labours. His last publication was the *Essai sur l'Histoire de la Formation et de Progrès du Tiers Etat*, in 1853. The author died 22d May 1856, his wife having predeceased him in 1844. During his life T. enjoyed the success and popularity due to his industry and talents. His careful research has thrown much light on the early ages of which he has written, and dispelled much popular error regarding them. He is second to no French historian of the present day.

THIERS, Louis Adolphe, French historian and statesman, was born April 16, 1797, at Marseille. His father was a working locksmith. His mother belonged to an old commercial family, which numbered among its members Joseph and André Chénier, but which had fallen into poverty. He was placed by her relatives in the Imperial Lyceum of Marseille, where he achieved many victories over his young competitors before the year 1815, when he was sent to Aix to pursue the study of the law. Here he formed his friendship with M. Mignet the historian, in company with whom, as soon as he had taken his degree as advocate, he set off to Paris to seek his fortune. He lived for a time in obscurity and indigence, but obtaining an introduction to Lafitte, he was enrolled among the contributors to the *Constitutionnel*, then the leading Liberal organ. He became distinguished for the vigour and hardihood of his articles, and as in France the occupation of a journalist was at that time, and for many years afterwards, regarded with an estimation proportioned to its influence over society, the young political writer was admitted into the most brilliant circles of the Opposition. In the crowded saloons of Lafitte, Casimir Perier, the Comte de Flahault, the Baron Louis (the great financier of the era), and of M. de Talleyrand, he enjoyed an intercourse with actors in the grand revolutionary drama, which was eminently useful to him in the great undertaking which he had long meditated. *L'Histoire de la Révolution Française* at once placed the briefless advocate and young political writer in the highest ranks of literary celebrity. Three editions were soon called for, and the profits upon the sale, and the gift of a share in the *Constitutionnel* conferred upon him by an admirer, raised him to comparative affluence. Leaving his garret in the alley of Montesquieu, he emerged into fame, and became one of the most prominent men of France in the two paramount fields of literature and politics. In January 1830, he established a new paper of more democratic principles, the *National*. Assisted by Armand Carrel and some of the ablest men of the Liberal party, T., in this journal, waged unrelenting war against the Polignac administration, which at length, stung beyond endurance, took the desperate measure of issuing the ordinances of July. The revolution of 1830 was the result. T. now devoted himself to a public career, and was appointed Secretary-General to the Minister of Finance, and elected deputy for the town of Aix. His first appearance in the Chamber of Deputies gave no promise of his subsequent distinction. His diminutive person, his small face, encumbered with a pair of huge spectacles, and his whole exterior presenting something of the ludicrous, the new deputy, full of the impassioned eloquence of the revolutionary orators, attempted to impart the thrilling emotions recorded of Mirabeau. The attempt provoked derision, but soon subsiding into the oratory natural to him—simple, easy, vigorous, rapid, anecdotic—he became one of the most formidable of parliamentary champions. From 1832, when the Soult cabinet was constructed, he continued a minister, with one short interval, until 1836. He was by turns Minister of the Interior, Minister of Commerce and Public Works, and Minister for Foreign Affairs under various chiefs—Soult, Gérard, Mortier, and Broglie. In February 1836, he was nominated President of the Council and Foreign Minister by Louis Philippe. He only held this office until August 1836, when he passed into Opposition. In 1840, he was again called by the king to the premiership. He refused Lord Palmerston's invitation to enter into an alliance with England, Austria, and Prussia for the preservation of the integrity of the Ottoman Empire, from some lingering sympathy with the principles which dictated the first Napoleon's invasion of Egypt and Syria, and a desire to accomplish by diplomatic relations with Mehemet Ali that which Bonaparte had sought to effect by force of arms —a controlling power on the part of France in Syrian and Egyptian affairs. Lord Palmerston entered into the treaty without France, Acre was taken by the English fleet, and Mehemet Ali was driven out of Syria. The popular irritation in France fostered by T. was excessive, and nothing but the peaceful character of Louis Philippe prevented the French nation from rushing into a war of defiance to all the powers of Europe. T. alarmed the continent by his threats of setting aside the treaties of 1815, and extending the French frontier to the Rhine. It was computed that he spent not less than £8,000,000 in military and naval demonstrations. The effect of the ill blood thus generated was felt shortly afterwards in the seizure of the Society Islands, and in the remonstrances which the British government saw reason to address

to that of France respecting the ill treatment of Mr Pritchard, their consul at Tahiti. Louis Philippe dismissed his bellicose prime minister, and Europe again tasted the sweets of repose. He employed his leisure in historical pursuits. His *Histoire du Consulat et de l'Empire*, begun in 1845 and completed in 1860, is one of the greatest historical works of the age. The plan is vast and comprehensive. T. had authentic documents, and full and incomparable materials, at his disposal. War, administration, finances, the state of parties at home, and the intrigues of diplomacy abroad, are by turns grouped and distributed around some principal event which gives its name to each book. The style is easy and familiar in tone, the narrative calm and lucid, and there is little straining after colour or picturesque effect. It has been objected that there are too many military details in the work; but as it is the history of the greatest captain of modern times, it was desirable to enable even the unlearned reader to comprehend the incessant movements of troops, and the details of army organisation, which so vividly illustrate the genius and prodigious industry and activity of Napoleon I. T.'s descriptions of Marengo, and of some other great battles of the empire, are masterpieces of military history, and his narrative of the most complicated tactics is entitled to the praise of being as lucid in its explanations as it is comprehensive in its details. On the other hand, Great Britain and the other powers of Europe whose alliance ultimately caused the downfall of the empire, receive but scant justice at the hands of the historian. T. is unable to divest himself of his national feelings and prejudices, and is often the apologist and panegyrist of his hero and his policy when historic truth and impartiality would record a different verdict. His history, published in 16 vols., has been translated into most of the European languages. At the revolution of 1848 he accepted the Republic. Perceiving that Louis Napoleon aimed at imperialism, Thiers opposed him in the Chambers. After the *coup d'état* of 1851 he was arrested and imprisoned, and politely conducted to the frontier. After a year and a half he was permitted to return, Louis Napoleon having established himself in power. He resumed his historical labours. In 1863 he took the oath of allegiance to the empire. He was elected to the Chamber, and constantly spoke and acted against the emperor's ministry. He disapproved of the Crimean and Italian wars, and of the Mexican expedition, and vehemently opposed the late war with Prussia, declaring in a powerful speech that Prussia had given no cause for hostilities. He was also inimical to the treaty of commerce with Great Britain, and the free-trade policy. In Oct. 1870 he visited London, Vienna, and St Petersburg, and vainly sought aid for France against Prussia. On the 1st of Nov. he attempted an arrangement for an armistice for twenty-five days, in order to permit the elections to be held and the Constituent Assembly to be convened to ratify a treaty of peace, but without success. On the convening of a National Assembly in Feb. 1871, Thiers was, by an almost unanimous vote, chosen Executive Chief of the Republic of France, and his government was officially recognised by the English, Austrian, and Italian ambassadors. Yielding to dire necessity, terms of peace were accepted by him, the demands of Prussia being acceded to, and preliminaries signed on the 27th of Feb. During the reign of terror in Paris, the Thiers government was established at Versailles, and was reluctant at first to employ force for the suppression of the Communal revolution. But rigorous measures were finally entered upon, and after much desperate fighting, with various success, and the bombardment of Paris, the forces of the republic triumphed. T. was chosen by a very large majority 'President of the French Republic,' an office which he held till May, 1873, when Marshal MacMahon was appointed in his stead. He died September 3, 1877.

THIRLAGE is, in the law of Scotland, a peculiar right or servitude enjoyed by the proprietor of a mill over the neighbouring lands, whereby the owner or possessor of such lands is bound to carry the corn grown thereon to be ground at his mill. The miller or owner of the mill is entitled to certain duties from the suckeners, i. e., the possessors of the lands within the thirl or sucken, and these duties are called multures, being a proportion of the grain or flour. Such multures are called insucken multures; while outsucken multures are similar payments made by strangers, who are not bound to send their corn to the mill, but choose to do so. Many nice questions have been raised between proprietors on this subject; but these are technicalities which must sooner or later be abolished, and the whole system is unsuited to the present times. Thirlage is extinguished by the ruin of the mill or by forty years' exemption. In England, there is no similar right, except in some ancient manors where an immemorial custom to a like effect exists.

THIRSK, a parliamentary borough in the North Riding of Yorkshire, on both banks of the Codbeck, an affluent of the Swale, 23 miles north-west of York. It contains an old, large, and handsome Gothic church, and carries on manufactures of leather and saddlery. Pop. (1881) of borough, which returns a member to parliament, 6306.

THIRST is a well-known sensation, resulting from a peculiar state of the mucous membrane of the digestive canal, but especially of the mucous membrane and the fauces, usually caused by an insufficient supply of liquid. In cases of extreme thirst, there is a peculiar sense of clamminess in the mouth and pharynx; which, with the other disagreeable feelings, is almost immediately relieved by the introduction of liquid into the stomach, where it is absorbed by the veins. That the thirst is relieved by the absorption of the fluid, and not by its action as it passes over the mucous membrane, which seems to suffer most, is proved by the facts—(1) that injection of liquids into the stomach through a tube (in cases of wounded œsophagus), and (2) the injection of thin fluids, as water, into the blood, remove the sensation of thirst. An excessive thirst is often an important morbid symptom. It may arise from two very opposite conditions—one a condition of excitement, and the other of depression. Whenever the blood is in a state requiring dilution, and is too stimulating, as in fevers and inflammations, there is thirst; and, again, in cases of excessive secretion and exhaustion, as for example in cholera and in the two forms of diabetes, there is great thirst, which sometimes also attends the lowest stages of prostration in malignant diseases. When there is a great loss of the watery portion of the blood by profuse perspiration, caused not by disease, but by hard bodily exercise in a hot atmosphere, as in the case of coal-whippers, mowers, and reapers, &c., there is always great thirst, and from two to four gallons of beer or cider a day may, in these cases, be taken with impunity, if not with advantage. Cold tea, without milk or sugar, is the most satisfying drink under these circumstances. Independently of disease, great thirst may be induced by the use of salted meat or fish, highly-peppered curries, and other stimulating dishes, the ingestion of malt liquors drugged with salt and more pernicious matters, or of gin strengthened by sulphuric acid, &c. In all these cases, the symptoms point to the natural remedy.

THIRTY TYRANTS, at Athens, were a body of rulers invested with sovereign power after the close of

the Peloponnesian war. They were all native Athenians, but members of the aristocratical party, and chosen by the Spartan conquerors, who, knowing the animosity existing between the democracy and oligarchy of Athens, hoped to rule the city through the agency of the latter. Their government was a positive 'reign of terror,' marked by the most infamous cruelties. Even Mitford, with all his hatred of democracy, speaks of the 'shamelessness of crime' as surpassing all that had previously occurred in Grecian history. It lasted only one year, when it was overthrown by the return of the Athenian exiles under Thrasybulus.

THIRTY TYRANTS of the Roman Empire, is the collective title given to a set of military usurpers who sprung up in different parts of the empire during the 15 years (253—268 A. D.) occupied by the reigns of Valerian and Gallienus, and amid the wretched confusions of the time, endeavoured to establish themselves as independent princes. The name is borrowed from the Thirty Tyrants at Athens, but, in reality, historians can only reckon nineteen—Cyriades, Macrianus, Balista, Odenathus, and Zenobia, *in the East;* Postumus, Lollianus, Victorinus and his mother Victoria, Marius, and Tetricus, *in the West;* Ingenuus, Regillianus, and Aureolus, in Illyricum and the countries about the Danube; Saturninus, in Pontus; Trebellianus, in Isauria; Piso, in Thessaly; Valens, in Achaia; Æmilianus, in Egypt; and Celsus, in Africa.—See Niebuhr's *Lectures on Roman History*, and Gibbon's *Decline and Fall of the Roman Empire.*

THIRTY YEARS' WAR was not properly one war, but rather an uninterrupted succession of wars (1618—1648) in Germany, in which Austria, the most of the Catholic princes of Germany, and Spain, were engaged on one side throughout, but against different antagonists. This long-continued strife had its origin in the quarrels between the Catholics and Protestants of Germany, and the attempts of the former, who were the more powerful body, to deprive the latter of what liberty of worship they had obtained. The severe measures taken by the emperor, the head of the Catholic party, against the Protestant religion, led also to strictures on their civil rights; and it was to protect their political as well as their religious liberties, that the Protestants formed a union, 4th May 1608, with Frederick IV., the Elector Palatine, at its head. The rival union of the Catholic powers, under the leadership of the Duke of Bavaria, followed 11th July 1609. In Bohemia, the immense preponderance in numbers (two out of three) and influence of the Protestants, had forced from their Austrian king an edict of toleration (11th July 1609), which was at first faithfully observed; but during the reign of Matthias, sundry violations of it were made with impunity; and as the influence of Ferdinand of Styria (see FERDINAND II.), his successor, began to be felt in more flagrant partiality to the Catholics, the kingdom became a scene of wild excitement; three of the Catholic party were thrown from the window of the Bohemian council-chamber at Prague, and ultimately Ferdinand was deposed, and Frederick V., the Elector Palatine, chosen in his stead (1619); and Count Thurn, at the head of an insurgent army, repeatedly routed the imperial troops, and actually besieged the emperor in Vienna. The Catholic princes, though as apprehensive as their opponents of the encroaching policy of Austria, crowded to the emperor's aid; and while the Protestant union and James I. of Great Britain held aloof from Frederick, whose sole allies were Bohemians (under Thurn), Moravians, Hungarians, and a Piedmontese contingent of 3000 (under Count Mansfeld), a well-appointed army of 30,000, under Duke Maximilian, advanced to support the Austrians, and totally routed Frederick's motley array at Weissenberg (8th November 1620), near Prague, afterwards reducing the Upper, while an army of Spaniards under Spinola ravaged the Lower Palatinate, and the Saxons (in alliance with the emperor) occupied Lusatia. The Bohemians were now subjected to the most frightful tyranny and persecution; a similar policy, though of a more moderate character, was adopted towards the people of the Palatinate—the Protestant union standing aloof, and subsequently dissolving, through sheer terror. But the indomitable pertinacity and excellent leadership of Count Mansfeld and Christian of Brunswick, two famous partisan leaders, who ravaged the territories of the Catholic league, and the forced cession to Bethlem Gabor of large portions of Hungary and Transylvania, did much to equalise the success of the antagonistic parties.

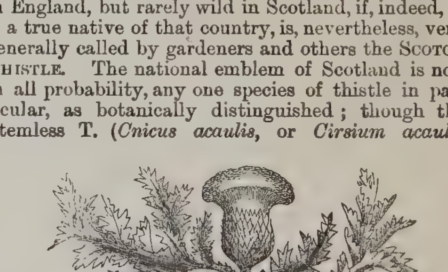
Here the war might have ended; but the fearful tyranny of Ferdinand over all the Protestants in his dominions (Hungary excepted), drove them to despair, and the war advanced to its second phase. Christian IV. of Denmark, smarting under some injuries inflicted on him by the emperor, and aided by a British subsidy, came to the aid of his German co-religionists in 1624, and being joined by Mansfeld and Christian of Brunswick, advanced into Lower Saxony, while the emperor, hampered by the political jealousy of the Catholic league, was unable to oppose him. But when, by the aid of Wallenstein (q. v.), a powerful and effective army had been obtained, and the leaguers under Tilly, in co-operation with it, had marched northwards, the rout of the Danes by Tilly at Lutter (17th August 1626), and of Mansfeld by Wallenstein at Dessau (1st, 11th, and 25th April 1626), again prostrated the Protestants' hopes in the dust; yet a gleam of comfort was obtained from the victorious raid of Mansfeld through Silesia, Moravia, and Hungary, though his scheme for an insurrection in Hungary failed, and his death soon after, at Zara, freed the emperor from a formidable and irreconcilable enemy. The combined imperialists and leaguers meantime had overrun North Germany and continental Denmark, and ultimately compelled King Christian to conclude the humiliating peace of Lübeck (12th May 1629). This second great success seems to have turned Ferdinand's head, for not content with a still more rigorous treatment of the Protestants, and the promulgation of the *Restitution Edict*, which seriously offended even the Catholics, he stirred up Poland against Sweden, and insulted Gustavus Adolphus, both personally and in the persons of his ambassadors—insolent impertinences which he soon saw bitter reasons to regret. The Catholic league now forced him to reduce his army, and supplant Wallenstein by Tilly; while France was inciting Gustavus to the willing task of aiding the Protestants in Germany.

The war entered its third phase by the landing of the Swedes at Usedom (June 1630), and their conquest of Pomerania and Mecklenburg. Gustavus, by the exercise of a little wholesome pressure, induced the Elector of Brandenburg to aid him; and though unable to save Magdeburg (q. v.), he marched to join the Saxons, completely routed Tilly at Breitenfeld (17th September 1631); victoriously traversed the Main and Rhine valleys; again routed Tilly on the Lech (5th April 1632), and entered Munich. By the judicious strategy of Wallenstein, he was, however, compelled to return to Saxony, where he gained the great victory of Lützen (q. v.); but his death, depriving the Protestants of the only man who could force the confederate powers to preserve unity

of action, was a severe blow to their cause; though the genius and indefatigable zeal of his chancellor, Oxenstierna, and the brilliant talents of the Swedish generals, preserved the advantages they had gained, till the crushing defeat of Bernard of Weimar at Nordlingen (6th September 1634), again restored to the emperor a preponderating influence in Germany. Saxony now made peace at Prague (30th May 1635), obtaining such satisfactory terms for the Lutherans, that the treaty was within three months adhered to by all the German princes of that sect, and the Calvinists were left to their fate.

Final success now appeared to demand only one more strenuous effort on the part of Austria; but Oxenstierna, resolved to preserve to Sweden her German acquisitions, propitiated Richelieu (q. v.), by resigning to him the direction of the war; and the conflict advanced into its final and most extended phase. The emperor, allied for offence and defence with the Lutherans, was now also assailed through his ally, Spain, who was attacked on her own frontier, in the Netherlands, and in Italy; Bernard of Weimar fighting independently, with the view of obtaining Alsace for himself, opposed the leaguers; while the Swedes, under Baner, held North Germany, and by frequent flying marches into Silesia and Bohemia, distracted their opponents, and prevented them, after their successes over Duke Bernard, from proceeding with the invasion of France. The great victory of Baner over the Austrians and Saxons at Wittstock (4th October 1636), restored to Sweden the victor's wreath she had lost two years before; and from this time, especially under Torstensohn (q. v.) and Konigsmark, the Swedes were always successful, adding a second victory of Breitenfeld (2d November 1642), one at Yankowitz (14th February 1645), and numberless ones of less note, to their already long list of successes, carrying devastation and ruin into the hereditary territories, even to the gates of Vienna, defeating the best generals of the empire, till, from a profound feeling of inability to check them, the Austrians hardly dared appear to the north of the Danube. On the Rhine, the leaguers at first had great success—the Weimar troops, now in French pay, were almost exterminated at Duttlingen (24th November 1643); but after the Spanish power had been thoroughly broken in the Netherlands by Condé, the French were reinforced on the Rhine, and under Condé and Turenne (q. v.), rolled back the leaguers through the Palatinate and Bavaria, and revenged at Nordlingen (3d August 1645) the former defeat of the Swedes. The emperor was now deserted by all his allies except the Duke of Bavaria, whose territories were already mostly in the hands of Turenne and Wrangel; and a combined invasion of Austria from the west and north was on the point of being executed, when, after seven years of diplomatic shuffling, with an eye to the changing fortunes of the contest, the Peace of Westphalia (q. v.) put an end to this terrible struggle.

THISTLE (*Carduus*), a genus of plants of the natural order *Compositæ*, sub-order *Cynarocephalæ*, with spinous leaves, imbricated involucres, and heads of flowers, consisting of tubular hermaphrodite florets alone, very rarely diœcious, stamens free, pappus deciduous, the receptacle having chaffy bristles. The flowers are sometimes large, generally purple, rarely white or yellowish. Recent botanists have divided this genus into two genera—the true T. (*Carduus*), in which the pappus is composed of simple hairs, and the Plume T. (*Cirsium* or *Cnicus*), in which the pappus is feathery.—The species of both genera are numerous, and are found in most of the temperate and cold parts of the northern hemisphere, annual, biennial, and perennial herbaceous plants of considerable size.—The MILK T. (*Carduus Marianus*), a biennial, native of Britain and other parts of Europe, attains a height of 4—6 feet, and is remarkable for the milky veins of its large waved leaves. The bracteæ of the involucre are subfoliaceous and recurved. The young leaves are sometimes used as a spring salad. Blanched leaves are used in winter salads. They are also used as a boiled vegetable, along with the young stalks, after these have been peeled and soaked in water to extract part of their bitterness. The root is used as salsafy. In former times, the plant was frequently cultivated.—The Canada thistle (*Cirsium arvense*, or *Cnicus arvensis*), a species about 1—3 feet high, with creeping roots, pinnatifid leaves and numerous diœcious flowers, is a very troublesome weed in fields, very common in Britain, and now too common, not only in Europe, where it is indigenous, but in America and other countries to which it has found its way. *Cirsium lanceolatum* and *C. palustre*, both common British plants, are also regarded as troublesome weeds. The former has larger flowers than any of the other species common in Britain. *Cirsium oleraceum* is a native of the north of Europe, but not of Britain, distinguished by its yellowish flowers, which are surrounded with large yellowish involucral bracteæ. The young leaves are used as a culinary esculent.—The BLESSED T. (*Carduus benedictus* of the pharmacopœias, *Cnicus benedictus* or *Cirsium benedictum* of modern botanists) is a native of the Levant and of Persia, resembling in appearance a *Centaurea*, with yellow flowers enveloped in leaves, and abounding in a gossamer-like down. The whole plant has a very bitter and disagreeable taste, and, besides a bitter extractive, contains much sulphate and muriate of potash and sulphate of lime. It is a powerful laxative-tonic medicine, and a strong decoction of it readily induces vomiting.—The COTTON T. (*Onopordon*) is a distinct genus, known by its receptacles being destitute of bristles, and coarsely and deeply honey-combed. The common Cotton T. (*O. acanthium*), a native of Europe, and found in England, but rarely wild in Scotland, if, indeed, it is a true native of that country, is, nevertheless, very generally called by gardeners and others the SCOTCH THISTLE. The national emblem of Scotland is not, in all probability, any one species of thistle in particular, as botanically distinguished; though the Stemless T. (*Cnicus acaulis*, or *Cirsium acaule*)



Stemless Thistle (*Cnicus acaulis*).

is in many districts of Scotland so designated. According to the common tradition, the Danes (or Norsemen?) came upon the Scots unperceived in the dead of night; and, halting while their spies were trying to discover the undefended points of their opponents' camp, one of the spies chanced to tread upon a thistle of this species, and the loud imprecation which the sudden pain evoked aroused the unsuspecting Scots, who at once attacked the invaders, gained a complete victory and dubbed the plant which had been the means

of their success, the Scotch Thistle. The Cotton T. has large elliptic leaves, and a broadly winged stem. The young fleshy root and the stem, whilst still tender, are in many places boiled and eaten. The expressed juice of the plant was formerly reckoned good for cancerous sores and cutaneous eruptions. —Plants of the genus *Silybum*, distinguished by its monadelphous stamens, and of the genus *Echinops*, which has a very different manner of growth, and belongs to a very different section of the *Compositæ*, are often to be seen in flower-gardens, where they are known as Thistles. The name is also, generally with some addition, very often bestowed upon many plants which have little resemblance to any of these, except in their spinous character. *Centaurea cyanus* is commonly known as the BLUEBOTTLE.—There are numerous species of Thistle (*Cirsium*) natives of the United States, among which *C. Virginianum*, *horridulum*, *altissimum*, and *muticum* are most common.

THISTLE, ORDER OF THE, called also the Order of St Andrew (q. v.). The following is a more accurate account of the institution of the order than is given in the article referred to: The order is of no very ancient date. The earliest-known mention of the thistle as the national badge of Scotland is in the inventory of the effects of James III., who probably adopted it as an appropriate illustration of the royal motto, *In defence*. Thistles occur on the coins of James IV., Mary, James V., and James VI.; and on those of James VI. they are for the first time accompanied by the motto, *Nemo me impune lacesset*. A collar of thistles appears on the

Star Collar and Badge of the Order of the Thistle.

gold bonnet-pieces of James V. of 1539; and the royal ensigns, as depicted in Sir David Lindsay's armorial register of 1542, are surrounded by a collar formed entirely of gold thistles, with an oval badge attached. This collar, however, was a mere device until the institution, or, as it is generally but inaccurately called, the revival of the order of the Thistle by James VII. (II. of England), which took place on May 29, 1687. Statutes were issued, and eight knights nominated by James; but the patent for the institution of the order never passed the Great Seal. After falling entirely into abeyance during the reign of William and Mary, the order was revived by Queen Anne, December 31, 1703.

THISTLEWOOD CONSPIRACY, a conspiracy formed in 1820 by Arthur Thistlewood, a man of profligate habits, and a few other adventurers of desperate fortunes, to overturn the government of Britain, and assassinate the ministers of the crown. The opportunity was to be taken of the funeral of George III., when all the military would have left London for Windsor, to take possession of London, and plunder the shops. The ministers were to be massacred when assembled at a cabinet dinner, and the pieces of cannon in Gray's Inn Lane and the Artillery Ground were at the same time to be seized. A provisional government was to be established, and means taken to intercept communication with Windsor and Woolwich, and prevent any one from leaving England by sea. The conspirators were surprised, and most of them apprehended by the police in the garret in Cato Street, where their meetings were held, on February 23, the same day which had been fixed for the massacre of the ministers. A few turned king's evidence against the rest; and Thistlewood and four others suffered the penalty which the law annexed to treason.

THO'LEN, an island in the Netherlands, province of Zeeland, bounded on the S. by the Easter Scheldt, contains about 34,000 acres of rich land, and is defended from floods by strong dykes, the borders of which are planted with trees. Pop. 14,078. Wheat, rye, barley, oats, beans, and potatoes are extensively grown. The annual produce of madder reaches a million of pounds-weight, and of flax, 400,000. Horses, cattle, sheep, and swine are kept in large numbers. Tholen, the chief town, with a pop. of 2540, is situated in the south-east corner of the island.

THOLUCK, FRIEDR. AUG. GOTTREU, a German Protestant theologian, whose reputation is perhaps greater in England and America than at home, was born at Breslau, March 30, 1799, and studied, first, at the university of his native city, and afterwards at Berlin, where oriental studies claimed his special regard, the first-fruits of which was his *Suffismus sive Theosophia Persarum Pantheistica* (Berl. 1821). The state of his religious opinions may be conceived from his own confession, that when he left Breslau, he thought nearly as much of Mohammedanism as of Christianity. The influence of Neander, however, and still more of Baron von Kottwitz, a philanthropic Christian nobleman of Silesia, produced a radical change in his convictions and modes of thought, and as early as 1823, he appeared as a champion of evangelical doctrines in his *Wahre Weihe des Zweiflers* (True Consecration of the Sceptic; 7th ed. published at Hamb. 1851, under the title of *The Doctrine of Sin and the Propitiator*, and translated into English, French, Danish, Swedish, and Dutch). Next year he published his *Auslegung des Briefs an die Römer* (Exposition of the Epistle to the Romans; Berl. 1824; 4th ed. 1842; also translated into English and other languages). About the same time he was appointed Extraordinary Professor of Theology at Berlin; and in 1825, he paid a visit to England. On his return, in 1826, he succeeded Knapp as Ordinary Professor of Theology at Halle, where, with the exception of a brief official sojourn at Rome, he remained until his death. T.'s position at Halle was far from pleasant at first, for the majority of the theological faculty, among whom was Gesenius, were very decided rationalists, and did all in their power to make the new professor miserable; but the latter, though not a man of very powerful intellect, was filled with a quiet, earnest, resolute *faith*, and he continued his evangelical

labours in spite of all opposition, until they were crowned with success. The university of Halle is at present, mainly owing to T., as thoroughly Christian, though not, perhaps, so strictly orthodox as it was in the days of Francke. His kindness (and that of his wife) towards students, especially *poor* students, was proverbial, and contributed not a little to his fame abroad. In 1843 he was chosen a member of the Magdeburg Consistory. Tholuck's fertility as an author was remarkable. Besides the works already mentioned, we may specify among his exegetical writings his *Praktische Commentar zu den Psalmen* (Practical Commentary on the Psalms; Hamb. 1843); *Commentar zum Evangelium Johannis* (Commentary on the Gospel of John; 6th ed., Hamb. 1844); *Commentar zum Briefe an die Hebräer* (Commentary on the Epistle to the Hebrews; 3d ed. Hamb. 1850); and *Philosophisch-theologische Auslegung der Bergpredigt* (Philosophico-theological Exposition of the Sermon on the Mount; 3d ed. Hamb. 1845). Of his dogmatic writings, the principal are contained in the *Literarische Anzeiger für Christliche Theologie und Wissenschaft*, a journal now discontinued; and in his *Glaubwürdigkeit der Evang. Geschichte* (Credibility of the Gospel History; Hamb. 1837), a treatise directed against Strauss's *Leben Jesu*. Among his contributions to history of theology, are to be reckoned his *Vermischte Schriften grösstentheils apologetischen Inhalts* (2 vols., Hamb. 1839); *Der Geist der Luth. Theologen Wittenbergs im 17 Jahr* (The Spirit of the Lutheran Theologians of Wittenberg in the 17th Century; Hamb. 1852); *Das Academische Leben des 17. Jahrh.* (The Academic Life of the 17th Century; Halle, 1853—1854); and his *Geschichte des Rationalismus* (History of Rationalism), published in several parts and completed in two divisions. Besides these may be mentioned several volumes of sermons on the leading doctrines of the Christian faith, published at different times. He died at Halle, July 3, 1877.

THOMAS, JOSEPH. See SUPP. in Vol. X.

THO'MAS, ST, one of the most westerly of the group of Virgin Islands, is situated in lat. 18° 20′ N., long. 65° W.; area (*Almanach de Gotha*, 1866), 23 sq. m.; pop. about 13,000. It belongs to Denmark.

The interior of the island is mountainous, and not very fertile. Since the emancipation of slaves in 1847, the cultivation of sugar has been entirely abandoned. Cotton is planted, but only in small quantity. The climate is hot, dry, and unhealthy; yellow fever is endemic, and preys much upon Europeans, the natives being seldom affected by it.

The principal town, Charlotte Amalie, is situated on the side of the mountain, and descends nearly to the margin of the harbour. The houses, which appear from the harbour tier above tier, and have a beautiful and picturesque effect, are built of a bright cream-coloured limestone, surrounded with balconies, verandahs, and jalousies, fancifully painted, and the roof covered with galvanised iron or shingles (the latter gaily coloured when brightened up with the rays of a tropical sun), and presenting at night, when lighted up with lamps, a very striking effect. The town itself is laid out with rather narrow streets, but there are some good stores and hotels in the place. The governor's house, to the east of the town, is a large and imposing building; and an ancient ruin, 'Blue Beard's Castle,' crowns an elevation. The harbour is land-locked on three sides; the entrance to it, fortified on both sides, is rather narrow. The harbour is spacious, and has deep water, is much occupied with shipping of many nations, and has been much improved since 1864 by dredging. The Royal Mail Steam-packet Company have made it a central station for their large steamers, from whence the intercolonial steamers diverge on their different routes through the adjoining seas. In the year 1864, 714 British vessels of all kinds, exclusive of ships of war and mail-packets, entered the harbour. The value of the British manufactured goods imported in 1864 was £700,000.

THOMAS, CHRISTIANS OF ST, a remarkable religious community settled from a very early date on the Malabar coast of the Indian peninsula. They take their name from the apostle St Thomas, who, according to a very ancient tradition, for which, however, no very positive evidence or satisfactory authority can be alleged, preached in India, and is regarded as the apostle of that country. As early as the 6th c., the well-known voyager, Cosmas Indicopleustes, reports of numerous Christian communities settled in India, under the pastoral care of bishops sent from Persia. To this circumstance it may be attributed that the Indian Christians, like those of what may be called the mother church of the Persian kingdom, lapsed into the Nestorian heresy, which, after the decrees of Ephesus and Chalcedon, having been suppressed by the civil laws of the Roman Empire, was driven beyond the limits of Roman authority, and found its most favoured seat among the hostile Persians. Once established among the people, these opinions continued to be professed by the Christians who survived in those regions the vicissitudes of the revolutions of which India in medieval times was the scene. Their seat was almost entirely along the Malabar coast, and extended from the south cape, Comorin, as far as Calicut; and they are found scattered throughout this length over the whole space from the western declivity of the Ghauts to the sea. From the time of their lapsing into Nestorianism, their bishops were ordained by the Nestorian patriarch of Babylon, and they possessed certain civil rights under the successive dynasties which ruled in the south of India. On the whole, however, they were much oppressed; and on the arrival of the Portuguese in 1598, the Christians of St T., although Nestorians, regarded them as their deliverers. Nevertheless, the diversity of creed was at once recognised by the western missionaries, and attempts were made by the successive bodies of missionaries, Franciscans, Dominicans, and finally Jesuits, to reconcile them to the Roman Church. A union, more or less real, was effected by a synod held at Diamper in 1599; and one of the Jesuit Fathers, Padre Roz, was named bishop in 1601. This union, however, was not lasting; they fell away once again from the Roman communion, and the expulsion of the Portuguese from Cochin by the Dutch completed the disruption. A considerable number of them, however, were again united to Rome through the missionaries of the Carmelite order; and towards the close of the 17th c., the Emperor Leopold I. obtained the leave of the Dutch to send a bishop and twelve priests of that order to the Malabar coast. One of the most serious impediments to the influence of those missionaries, as well with the schismatics as with the heathen, was found in the intrigues and jealousies of the Portuguese. In later times, the Christians of St T. have for the most part been absorbed in the native Christian population. Their tenets were in the main those of the Nestorians of Chaldea and Mesopotamia, about the precise details of which much controversy has prevailed, and many conflicting statements have been made, according to the religious views of the various travellers or missionaries who have reported regarding them. Much of this conflict of testimony arises from a confusion of names rather than of things. See NESTORIANS.

THOMASIUS, Christian, a German philosopher and jurist, was born at Leipzig, 1st January 1655, studied at Frankfurt-on-the-Oder (1675—1679), and returning to his native town, commenced to lecture on law in a style perfectly free from the pedantry of the schools. In 1687, to the astonishment of his Latin-speaking colleagues, he adopted the German language as the vehicle of his expositions, published his programme for the following year in the same tongue, and commenced a monthly journal under the very German title of *Freimüthige, lustige und ernsthafte, jedoch vernunft- und gesetzmässige Gedanken oder Monatsgespräche über allerhand, vornehmlich aber neue Bücher* (Honest, Merry, Sincere, yet Rational and Moderate Thoughts, or Monthly Talk concerning all Sorts of Books, but especially new Ones). This work, however, excited so much opposition that he was forced to leave Leipzig, and went first to Berlin, and afterwards (1690) to Halle, where, under the patronage of the Brandenburg court, his lectures were the means of establishing a university, since famous. In this university T. became Professor of Jurisprudence, and here he died, 23d September 1728. The great aim of T. was to harmonise and blend science and life; hence his contempt for hair-splitting subtleties of which nothing could be made; his preference for the use of German rather than Latin in his academic lectures; his disinclination to all philosophical terminology, his depreciation of the schoolmen, &c. But more particularly he was among the first who insisted on dissociating natural right from morality, and in connection therewith, honourably signalised himself as a courageous opponent of trial for witchcraft and punishment by torture. The characteristic features of his mode of thought are contained in his *Vernünftige und Christliche aber nicht scheinheilige Gedanke und Erinnerungen über allerhand auserlesene, gemischte, philosophische und juristische Händel* (Rational and Christian, but not pretendedly Pious Thoughts and Recollections concerning sundry Choice, Mixed, Philosophical, and Juristic Transactions, 3 vols., Halle, 1723—1726); and in his *Geschichte der Weisheit und Thorheit* (History of Wisdom and Folly).—See Luden, *Christian Thomasius nach seinen Schick-salen und Schriften* (Berl. 1805).

THO'MASTON, a town and port of Maine, U. S., on the St George River, 15 miles from the coast, and 80 miles east-north-east from Portland. Its extensive granite quarries are worked by the convicts of the state prison; 300,000 casks of lime are exported annually; registered shipping, 60,000 tons; 5 churches, 2 public libraries. Pop. (1880) 3017.

THO'MISTS. See Aquinas.

THOMSON, James, author of *The Seasons*, was born on the 11th September 1700, at Ednam, in Roxburghshire, of which parish his father was minister. He was put to school at Jedburgh, and afterwards sent to complete his education at Edinburgh. His intention was to enter the church, and he went through a full course of study with that object in view. His views, however, changed. From a very early age, he had been wont to express himself in verse; and in 1725 he betook himself to London, to seek fame and fortune as a poet. Almost his sole capital for the enterprise seems to have been his manuscript poem of *Winter*. This, with some little delay and difficulty, he disposed of to a publisher for three guineas; and as its success was not instant, his outlook was by no means brilliant. Gradually, however, the merits of the poem were recognised; successive editions were called for; friends and patrons were not wanting to the young author; and in no long time T. found himself as good as a made man and poet. The *Winter* was followed in 1727 by the poem *Summer; Spring* was published the year after; and *Autumn*, completing *The Seasons*, appeared in 1730, with a reissue of the previous portions. In 1729, T. produced the tragedy of *Sophonisba;* but though great expectations were formed of it, its success on the stage was but indifferent. A weak line which occurred in it—

O Sophonisba, Sophonisba, O,

as parodied by a wag in the pit into

O Jemmy Thomson, Jemmy Thomson, O,

afforded much merriment to the town, and somewhat killed the pathos of the author, otherwise with not much vitality in it. During 1730—1733, T. was abroad in Paris and elsewhere with the son of Sir Charles Talbot, the Chancellor; and on his return, at the death of his pupil, the comfortable place was bestowed upon him of Secretary of the Briefs. This he held till it lapsed, on the death of the Chancellor in 1737, which left him once more in considerable straits, which were, however, a little alleviated by a pension of £100 a year given him by the Prince of Wales. His tragedy of *Agamemnon*, produced in 1738, was, in Johnson's phrase, 'only endured, but not favoured;' and his poem on *Liberty*, by himself considered his greatest work, was little relished by the public. His *Tancred and Sigismunda*, produced in 1745, was the only one of his tragedies which had any success, and its success was not of a signal kind. About this time, the accession to power of his friend Mr Lyttleton secured him the office of Surveyor-general of the Leeward Islands, which, however, he did not long live to enjoy. He died of a neglected cold in August 1748, and was buried in the church of Richmond, without an inscription; but a monument was afterwards erected to his memory in Westminster Abbey. In the spring before his death he had published his finest poem, *The Castle of Indolence.* This piece, which is written in the Spenserian stanza, has all the descriptive power and opulence of imagination which distinguish his more popular *Seasons*, while in tone and diction it is much more chastened and harmonious. Together, they continue to maintain for T. a somewhat high place in the roll of British poets. Of his other works, with the exception of the song of *Rule Britannia*, nothing but the names is now remembered. As a man, T. was singularly amiable, and his careless, indolent generosity of disposition seems to have endeared him to all who knew him.

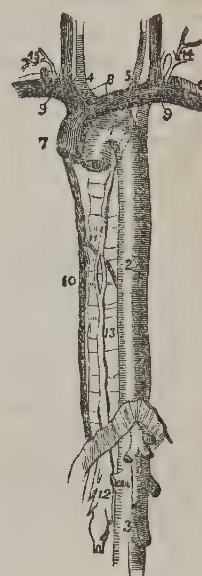
THOMSON, Sir William, one of the greatest living mathematicians and natural philosophers, was born in June 1824. His father was Professor of Mathematics in the university of Glasgow. T. graduated in 1845, as second wrangler and first Smith's prizeman at Cambridge, where he was shortly afterwards elected to a fellowship in St Peter's College; and became Professor of Natural Philosophy in the university of Glasgow in 1846. This appointment he still holds. While still an undergraduate, he published several valuable papers. He was for some time editor of the *Cambridge Mathematical Journal*, and some of his most brilliant discoveries have appeared in its pages. He has also contributed to the *Comptes Rendus, Liouville's Journal de Mathématiques*, the *Philosophical Magazine*, the Transactions and Proceedings of the Royal Societies of London and Edinburgh, and various other journals. All his numerous writings have the stamp of originality in a marked degree. In the mathematical theories of Elasticity, Heat, Electricity, and Magnetism, he has made remarkable discoveries; among which we need merely mention the Dissipation of

Energy, the beautiful idea of Electric Images, and the complete solution of the problem of telegraphing through a submarine cable. Besides this analytical work, he has made extensive and valuable experimental investigations, both alone and in conjunction with Joule (q. v.). Popularly, he is best known by his association with the Atlantic cable, a gigantic idea, which but for his investigations might perhaps not have been attempted. He has invented several excellent and useful instruments for various electrical purposes; instruments for the determination of electric units in absolute measure, &c.; and in July 1866, as Consulting Electrician to the Telegraph Construction and Maintenance Co., he assisted for the second time in the successful laying of an Atlantic cable. In 1870 he published a very remarkable paper, in which he arrives at a proof of the absolute magnitude of atoms, and which attracted marked attention in Europe and America. See *Leisure Hour* for August 1871.

His elder brother, JAMES, now Professor of Civil Engineering in Queen's College, Belfast, has made various improvements in the construction of Turbines (q. v.) and other engines; but is best known in science by his discovery that the freezing-point of water is lowered by pressure; and the glacier theory he has founded upon it. See HEAT, ICE, REGELATION.

THOR, the god of thunder, was the son of Odin and Earth (Yörd); his wife was Sif (= *sib*, friendship, love, and thus of the same import with Freyja). His palace, supported on 540 pillars, was called Thrudwanger; here he received the warriors that had fallen in battle. Thunder was caused by the rolling of his chariot, which was drawn by he-goats. He was in the vigour of youth, had a red beard, and was the strongest of all gods and men; the gods even called in his assistance when they were in straits. He was, in particular, a terror to the Giants (q. v.), with whom he was perpetually at strife, and whom he struck down with his hammer Miolnir (i. e., the smasher or mauler), which had the property of returning to his hand after being hurled; it had been made by cunning dwarfs. The sign of the hammer was among the heathen Teutons analogous to that of the cross among Christians. In the contest at the twilight of the gods, T. slew the serpent of Midgard, but fell at the same time poisoned by the venom exhaled from its mouth. The name of T. was widespread. The Saxons worshipped him as Thunar (High-German, *Donar*). Torden, the wrathful deity dreaded by the Lapps, who in his rage hurled down huge blocks from rocks, tore up trees, destroyed cattle and men, is evidently the Scandinavian Thor. The Gallic god Taranis—in an old inscription Tanarus—mentioned by Lucan, appears also to be identical, especially as *taran* in the Celtic languages still signifies thunder. The attribute of thunder is intimately associated with the Latin Jupiter and the Greek Zeus (see also INDRA). Of all the Asa-gods, T. had unquestionably the most worshippers. In Upsala, according to Adam of Bremen, he occupied the place of honour in the temple between Odin and Frikke. In Norway, T. was the national god, and here, as in Iceland, temples were almost exclusively erected to him. Offerings were made to him, particularly in times of pestilence. On the ground of the superior respect enjoyed by T., and of his being called 'Old Thor,' some place him in opposition to Odin, and consider him historically as an older divinity, only partly supplanted by the Odin doctrine. As rude force is the predominating element in T., the humorous element of the Scandinavian belief attaches to him. Thus, the giants often blinded him by magic, and made fun of him; yet he always shews his extraordinary strength in these cases, and in the long-run his opponents are invariably overcome by the hammer. Thursday is so called from T.; and the name survives in numerous names of places (Thuneresberg, in Westphalia; Thunderhill, in Surrey; Thurso), and also in personal names (Thorburn, in Scand. Thorbiörn).—Compare Uhland, *Der Mythus von Thor* (Stutt. 1836); Grimm, *Deutsche Mythologie.*

THORA'CIC DUCT, a canal equal in diameter to a goose-quill, proceeding from the *Receptaculum Chyli* (into which the contents of the lacteals are collected, and which is situated in the front of the body of the second lumbar vertebra), ascends along the front of the vertebral column, between the aorta and ascending vena cava, as high as the fourth dorsal vertebra; it then inclines to the left, and passing behind the arch of the aorta, ascends as high as the seventh cervical vertebra.



The Course and Termination of the Thoracic Duct.

1, the arch of the aorta; 2, the thoracic aorta; 3, the abdominal aorta; 4, arteria innominata; 5, the left carotid; 6, the left subclavian; 7, the superior vena cava, formed by the union of 8, the two venæ innominatæ; and these by the junction 9, of the internal jugular and subclavian vein at each side; 10, the vena azygos; 12, the receptaculum chyli; 13, the thoracic duct, often dividing in the middle of the thorax into two branches, which soon reunite (the course of the duct behind the great vessels is shewn by a dotted line); 14, the duct making its turn downwards before terminating in the veins of the left side; 15, the termination of the trunk of the duct on the right side.—From Wilson's *Anatomist's Vade-mecum.*

when it bends forwards and downwards, and terminates at the point of union of the subclavian and internal jugular veins of the left side, where it is provided with a pair of semilunar valves, which prevent the admission of venous blood into it. It is also provided with other valves on its upward course. This duct is not liable to any special diseases; but if its function of conveying chyle from its source into the general circulation be interfered with, as, for example, by the pressure of a tumour, the due nutrition of the system must be more or less interfered with.

THO'RAX. See CHEST.

THORI'NUM, or THO'RIUM (symb. Th; equiv. 115·72), is a rare metal, much resembling aluminium, but taking fire considerably below a red heat, and

burning with great briliancy. *Thorina*, or *Thoria*, is supposed to be the protoxide, and is remakable for its high specific gravity, 9·4. Thorinum was discovered in 1829 by Berzelius in an earth to which he had given the name *Thorina*, and which occurs in a rare black Norwegian mineral termed *Thorite*. None of the compounds of this metal are of any practical importance.

THORN. See Cratægus, Hawthorn, and Spine.

THORN (Pol. *Torún*), a strongly-fortified town of Prussia, in the south of the province of Prussia, on the right bank of the Vistula, 31 miles east-south-east of Bromberg by railway. The town was founded in 1232, was a member of the Hanseatic League, and contains many houses—as the town-hall—remarkable for their beautiful gables and interiors. It is the birth-place of Copernicus, whose monument is to be seen in the *Johannis-Kirche*, and a bronze statue to whom was erected in the market-place in 1853. An active trade in corn and timber is carried on. Pop. (1880) 20,614.

THORN, Conference of, one of those efforts to explain away the differences between the several bodies of Christians, with a view to religious reunion, of which the 17th c. furnishes more than one example. The originator of this movement was the king of Poland, Ladislaus IV., who proposed his project for the consideration of a synod of the bishops of his kingdom held at Warsaw in 1643, and letters were addressed in consequence to all the several religious bodies in Poland, inviting them to send delegates to an assembly to be held at Thorn, for the purpose of the mutual explanation of their doctrines, with a view to the removal of all differences of belief. The conference met in October 1645, and was opened in a spirit of moderation; but it soon lapsed into disputation and controversy, and at length broke up without any result, November 21, 1645. The official account of the proceedings of the conference are printed in Calvi's *Historia Syncretistica*.—See also Schröckh's *Kirchengeschichte seit der Reformation*, iv. p. 509.

THORN-APPLE (*Datura*), a genus of plants of the natural order *Solanaceæ*, having a tubular 5-cleft calyx, a large funnel-shaped 5-lobed flower, a 2-laminated stigma, and an imperfectly 4-celled, prickly, or unarmed capsule. The species of this genus are annual herbaceous plants, rarely shrubs or trees; and are in general very narcotic, and productive of excitement or delirium. The common Thorn-apple, or Jamestown Weed (*D. stramonium*), is an annual plant, with smooth stem and leaves, white flowers, and erect prickly capsules, a native of the East Indies, brought by the gipsies to Europe, where it is now very generally to be met with, as also in Asia, the north of Africa, and North America. It is by some stated to be the plant from which the poisonous 'dri' of the gipsies is obtained. It contains a peculiar narcotic alkaloid, *Daturine*, and is one of the most powerful narcotic acrid poisons; but its leaves and seeds are employed, although rarely, in medicine. The leaves have an extremely nauseous overpowering smell, and a loathsome bitter taste; the seeds, which are of a dark-brown colour, are still more poisonous. A variety with pale violet flowers and purplish violet stem is frequently cultivated in gardens as an ornamental plant.—Still more narcotic is the Soft-haired Thorn-apple (*D. metel*), a native of the south of Asia and of Africa. Robbers in India employ it in order to stupefy those whom they would rob, or rather to throw them into the condition of a waking dream. From its seeds, along with opium, hemp, and certain spices, a strong intoxicating substance is prepared, which the Mohammedans of India use in order to produce in themselves an indescribable joyfulness and extremely pleasurable feeling for a short time; but the use of

Common Thorn-apple (*Datura stramonium*).

it destroys the constitution. *D. Tatula*, another Indian species, has similar properties, and is very energetic; as is also *D. sanguinea*, the Floripondio of Peru, which is used by the Indians to prepare a very powerful narcotic drink, which stupefies when very diluted, and when strong, brings on maniacal excitement.—The beautiful *D. fastuosa* has flowers externally of a violet colour, and white within, and is cultivated as an ornamental plant, especially a variety with what are called double flowers, which consist rather of two corollas, one within the other.—*D. arborea*, a native of Peru and Colombia, has begun to be also very generally cultivated in flower-gardens in Europe. It has very splendid pendulous white flowers, 9—12 inches long, which diffuse a sweet smell in the evening and at night.

THORNBACK (*Raia clavata*), a species of ray or skate, common on most parts of the British coast. It attains a large size; the muzzle is little produced, and the form is nearly rhombic; the tail has two small membranous fins near the tip, on the

Thornback (*Raia clavata*).

upper central ridge, and a small dilatation at the tip. The upper surface is brown, with lighter spots; the under surface white. The upper surface is

rough with small points, and has numerous nail-like crooked spines, each with an oval bony base. The T. is much esteemed for food, particularly in autumn and winter, but is most abundantly captured in spring and summer, when it approaches the shore to deposit its eggs.

THOROUGH BASS. See FIGURED BASS.

THORWALDSEN, BERTEL, one of the greatest of modern sculptors, was born, it is supposed, at Copenhagen, on the 19th November 1770. Neither the place nor the day of his birth, however, can be fixed with absolute certainty; and he himself, when casually questioned as to the last, replied with a certain *brusque* felicity: 'I don't know; but I arrived at Rome on the 8th March 1797;' dating his birth, as it were, from the commencement of his career as an artist. He was the son of a poor ship-carpenter, and his first essays in art were made in the carving of figure-heads in the yard where his father worked. His education was otherwise neglected, so that through life he could but indifferently write or spell; but the genius for art was born with him, and in 1793 he gained the first gold medal for design at the Academy of Copenhagen; and along with it the privilege of three years' residence abroad for the purpose of study. Accordingly, in 1796, he sailed for Rome, arriving there as stated above. After long obscure and patient labour, his talent became conspicuous. From the celebrated Canova, in particular, he had early and generous recognition; and shortly, by the model for his great work, 'Jason,' he secured general admiration. No purchaser could, however, be found for it till, in 1803, just as in hopeless disgust the artist was about to return to Copenhagen, he received from the well-known Thomas Hope an order for its production in marble at a price which might be called munificent. From this time forward, prosperity and fame flowed upon him in full tide. In 1819, he returned to Denmark, taking the overland route, and everywhere on his journey special honour was paid him. His reception in Copenhagen was triumphal, and apartments were assigned him in the palace of Charlottenburg. He remained at home but a year, and at the end of it returned to Rome, where he continued to prosecute his art assiduously, up to 1838, when he left it, intending to pass his remaining years in his native country. Its climate, however, proved no longer suitable to him, and the year 1841 found him once more at Rome. In 1844, having revisited Copenhagen, he died suddenly there in the theatre, of disease of the heart, on the 24th March. All the works remaining in his possession he bequeathed to his country, to be preserved in a museum bearing his name, for the maintenance of which he also left the bulk of his fortune, reserving a sufficient provision for Madame Poulsen, his natural daughter. This magnificent and unique collection is now one of the chief glories of the metropolis of his native country. By his countrymen, he is naturally held in special honour; and their proud verdict, which ranks him the greatest of sculptors since Michael Angelo, is elsewhere more generally acquiesced in than is often the case in such instances of national enthusiasm. Anything like a catalogue of his chief works need not be here attempted. He addicted himself by preference to classical and mythological subjects; but his great works in the cathedral of Copenhagen, 'Christ and the Twelve Apostles,' 'St John preaching in the Wilderness,' and the 'Procession to Golgotha,' sufficiently prove that he was determined to this preference by no incapacity to appreciate and grandly fulfil the demands of the Christian ideal. Of the many busts from his hand of eminent contemporaries, those of Byron and the great Danish poet Œhlenschläger are perhaps the most notable. The life of T. has been written by Hans Christian Andersen, also by J. M. Thiele of Berlin. Of M. Thiele's work, a careful abridgment, by the Rev. M. R. Barnard, was not long since published by Messrs Chapman and Hall, London; and this is as yet the only authoritative source of information in detail available for the English reader.

THOTH, also called TAUT or THEUTH, the Egyptian Hermes or Mercury, the mythical inventor of the arts and sciences, music and astronomy, and especially of speech and hieroglyphs or letters, over which he was supposed to preside. His name, indeed, meant 'speech,' or 'word,' and he personified the divine Logos, or intellectual power. See HERMES, EGYPT.

THOU, JACQUES AUGUSTE DE, or, as his name is frequently written, Jacobus Augustus Thuanus, son of Christophe de Thou, first president of the Parlément de Paris, was born in that city on the 8th October 1553. He was originally designed for the church, but when old enough to judge for himself, he gave up all thoughts of an ecclesiastical career. In spite of the difficulty presented by a sickly constitution, he pursued both literary and scientific studies with vigour and success. Taking a liking for the writings of Cujacius, he took up his residence at Valence in Dauphiné, where he attended the lectures of the celebrated jurist. At Valence, he made the acquaintance of Scaliger, with whom he maintained an unbroken friendship for the rest of his life. In 1578, he accepted, with reluctance, the office of ecclesiastical councillor of the Parlément of Paris. A firm adherent of royalty, in 1588, he was made councillor of state to Henry III.; and during the rest of the reign of that king, he took a leading part in all public affairs. On the accession of Henry IV., he was made keeper of the royal library. In 1593, he began his great work, the *Historia sui Temporis*, which principally occupied him during the remainder of his life. He took an important part in the arrangement of the Edict of Nantes; but, with this exception, he seems to have given but little attention to public affairs during the reign of Henry IV.; and the death of that monarch, in 1610, may be said completely to have ended his political existence. From 1604, when the first 18 books of the history appeared, the author held the position of first historian of his age. Eighty books appeared during his life; and the remainder, forming in all 138 books, were published in 1620, after the author's death, which took place on the 7th May 1617.

As a historian, T. is eminently impartial; so devoid, indeed, did his work shew him to be of religious prejudice, that he incurred the imputation of having no religion about which to feel; the consequence being that, in 1609, his work was put into the *Index Expurgatorius*—a fact which appears to have distressed him more than one would have expected. Written in Latin, the author has spared no pains to make it severely classical. It is generally held valuable rather from its workmanship than its material. The best English edition is that by Samuel Buckly, 7 vols. 1733. T. also wrote a number of Latin poems.—See *Autobiography*, ending 1601; also Colinson, *Life of Thuanus* (Lond. 1807).

THRACE, anciently the name of an extensive country bounded on the N. by the Danube, on the E. by the Euxine, on the S. by the Ægean and Macedonia, and on the W. by Macedonia and Illyria. In pre-historical times, however, the name

appears to have denoted the whole of eastern Europe north of Greece, including both Macedonia and Scythia; so, at least, one is disposed to understand the fable, that Oceanus had four daughters—Asia, Libya, Europa, and Thracia. It is, on the whole, very mountainous—whence, perhaps, its name T., from *tracheia*, rugged (?)—the principal range being Hæmus (mod. *Balkan*, q. v.), from which three lesser chains branch off in a south-easterly direction, the loftiest being Rhodope, the summits of which reach an elevation of more than 8000 feet. The three most important rivers of T. are the Strymon (mod. *Struma*), which, during the Greek period, formed the boundary between it and Macedonia; the Nestus (mod. *Carasu*); and the Hebrus (mod. *Maritza*, q. v.), the largest—all of which flow southward from Hæmus into the Ægean Sea. Roughly speaking, ancient T., before the rise of the Macedonian power, comprised the territory now divided by the Turks into the provinces of Rumili and Bulgaria; but subsequently the Romans made the range of Hæmus the northern limit of T., and gave the region between Hæmus and the Danube the name of Mœsia (mod. *Bulgaria*). The climate was considered by the Greeks very severe—even that of Ænos, on the shores of the Ægean, being described by Athenæus as 'eight months of cold and four months of winter;' but it is believed that the ancient accounts are much exaggerated, or are only applied to T. poetically as the *North*, though it is not to be denied that, in the mountainous districts, the frost was often intense—as is still the case. The country was marshy, undrained, and overspread with dense damp forests (of fir, oak, chestnut, &c.), which must have considerably lowered the temperature; but large portions, especially in the south and east, 'such as the great plain of Adrianople and the land towards the lower course of the rivers Nestus and Hebrus,' were very fertile. The chief products were corn, millet, wine, and hemp. Cattle, sheep, horses, and swine were reared in great numbers. The region between the Nestus and the Strymon appears to have been infested by lions. Herodotus states that they attacked the baggage-camels of Xerxes on his march; but if this was anciently the case, these formidable animals have long since disappeared. Gold and silver mines were numerous and productive in the same locality, and the acquisition of these was the principal motive for Philip of Macedon's aggressions.

The question has been much discussed, to what race the Thracians belonged, and it cannot be said that it has as yet been satisfactorily settled. It is certain, however, that two different peoples went by this name in early times. It is repeatedly asserted by those writers who treat of the confused medley of tradition and myth which fills up the pre-historical annals of Greece, that a race of 'Thracians' inhabited part of the Hellenic peninsula, and had even at one time extended themselves as far as Attica. To these pre-historic Thracians belonged, says Strabo, the Muses, and the cultivators of ancient music, Orpheus, Musæus, Thamyris, and Eumolpus; and the grand argument against confounding them with the Thracians of history, is the impossibility of a race so notoriously barbarous as the latter in language and manners, having sprung from the authors of Hellenic literature and art (see Müller's *Hist. of Greek Lit.*, p. 26, *et seq.*). But whether the pre-historic Thracians were properly Hellenes, or 'Pelasgians'—whatever *that* may mean—is indeterminable.

Passing now to the historic Thracians, whom we find settled in the regions north and east of Macedonia, we are again at fault. Of their manners and customs, of their character, and of their later history, we indeed know something; but of their origin and ethnological relations, we cannot be said to know anything. They were not Greeks, for they spoke a language which the latter called barbarous: but if (as Strabo asserts) the Getæ and Daci were branches of the Thracian family, and spoke the same tongue, we may conjecture that, ethnologically, the term 'Thracians' denotes a mixed Illyrico-Scythian race; though it is quite impossible, from want of evidence, to substantiate the conjecture. Herodotus, Xenophon, and Strabo are our chief authorities regarding the habits and practices of the people. From them we learn that they bought their wives, and sold their children. Polygamy was general, and when a husband died, his favourite spouse was slain over his grave. Before marriage the Thracian women enjoyed the utmost liberty; after it, they were guarded with Turkish rigour. War and robbery were the only honourable occupations of the men. They lived to steal, either from each other or from neighbouring peoples. When not fighting or plundering, they spent their days in savage idleness, or in quarrelling over their cups. Courageous, or rather ferocious, after the fashion of barbarous peoples, they yet lacked the steady valour and endurance of disciplined troops; at all times, their warfare displayed more fierceness and impetuosity than fortitude. Their treachery was probably no greater than that of other barbarians.

The history of T. may be sketched in a few words. The Greeks first became acquainted with the inhabitants when they began to plant colonies on the coasts. Of these, the principal were Byzantium (675 B.C.), Selymbria, Abdera (560 B.C.), Mesembria, Dicæa, Maronea Ænus, Cardia, Sestus, Amphipolis, &c.; but their want of union—the fatal weakness of Hellenic civilisation—hindered them from acquiring that measure of power to which they might have otherwise aspired, and enabled the Thracian chiefs of the interior to preserve their independence. In 513 B.C., Darius, king of Persia, marched through T. on his way to punish the European Scythians, and on his return, left Megabazus, with 80,000 men, to subdue the country. In this he partially succeeded, but new disturbances and complications arose between the Persians and Greeks, which resulted (480 B.C.) in the famous expedition of Xerxes, the details of which do not belong to Thracian history. We have only to mention that a consequence of the expulsion of the Persians from Europe was the resumption of liberty and the revival of prosperity among the Greek colonies in Thrace. Shortly before the Peloponnesian War, a native Thracian state—the Odrysian—had attained to great power and eminence under a ruler named Sitalces, who joined the Athenian alliance, but could not, in spite of his resources, prevent the triumph of Sparta in the north as well as in the south. The rise of the Macedonian kingdom, under Philip II. (359 B.C.), destroyed the independence of great part of Thrace. All the region between the Strymon and Nestus was incorporated with Macedonia, and Macedonian garrisons were established further east. Under the government of Lysimachus, the subjugation of T became complete. On the fall of the Macedonian kingdom (168 B.C.) it passed into the hands of the Romans, and subsequently shared the vicissitudes of the Roman Empire. In 334 A.D., a colony of Sarmatians was planted in T. by Constantine, and in 376, another of Goths by permission of Valens. In 395, it was overrun by Alaric, and in 447, by Attila. In 1353, Amurath obtained possession of all its fortresses, except Constantinople, and it has ever since remained in the hands of the Turks.

THRASHING is the separating of the grain or seeds of plants from the straw or haulm, a process which has been accomplished in different ages and countries by means less or more effective. The first method known to have been practised was the beating out of the grain from the ears with a stick. An improvement on this method was the practice of the ancient Egyptians and Israelites to spread out the loosened sheaves of grain on a circular piece of hard ground 50—100 feet in diameter, and to drive oxen backwards and forwards over it, so as to tread the grain out; but as this mode was found to damage a portion of the grain, it was partially superseded in later times by the thrashing-sledge (Egypt. *noreg*, cf. Heb. *moreg*), a heavy frame mounted on three rollers, which was dragged over the heaps of sheaves. The use of the stick was, however, retained for thrashing the lighter kinds of grain. Similar methods of thrashing were employed by the Greeks and Romans, the stick (*fustis*, *baculum*, *pertica*), the treading by men or horses, and the thrashing-sledge (*tribulum*) being found in common use among them; but their thrashing-sledge, which is still to be seen in operation in Greece, Asia Minor, Georgia, and Syria, differed from the eastern one by having pieces of iron or sharp flints fastened to the lower side, in place of rollers. The primitive implement in Northern Europe was the stick, and an improved modification of it, the *flail*, has not yet been completely superseded. The flail consists of two sticks loosely fastened together at one end by stout thongs (*caplins*), one stick (the *hand-staff*) is used as a handle by the workman, and by a circular swing round his head he brings down the other stick (the *swiple*) horizontally on the heads of the loosened sheaves spread out on the barn-floor. In the hands of a good workman, this implement is found to perform its work pretty effectively, although slowly.

Various attempts were made to supersede the flail by a machine, but with little success, till 1787, when Andrew Meikle, an ingenious Scotch mechanic, produced a thrashing-mill so perfect, that even after having run the gantlet of nearly a century of improvers, it is essentially the machine of its original inventor. In Meikle's mill, the mode of operation is as follows: The sheaves are loosened and spread out one by one on the feeding-board A (fig. 1), with the ears towards the machine; they

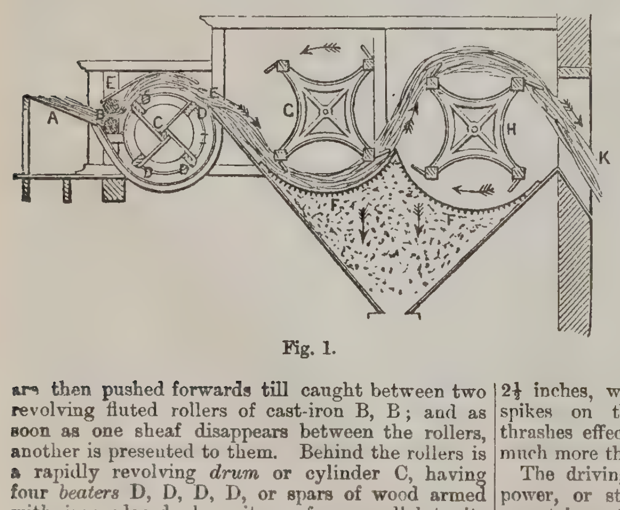


Fig. 1.

are then pushed forwards till caught between two revolving fluted rollers of cast-iron B, B; and as soon as one sheaf disappears between the rollers, another is presented to them. Behind the rollers is a rapidly revolving *drum* or cylinder C, having four *beaters* D, D, D, D, or spars of wood armed with iron placed along its surface parallel to its axle; and these beaters striking the heads as they are protruded from between the rollers, detach the seeds and husks. In order to render this, the important part of the process, more effective, the drum is provided with a cover, E E, which keeps the straw subjected to its action; and as the drum revolves many times more rapidly than the rollers, each portion of straw receives a succession of buffets from the beaters before the rollers quit hold of it. Grain and straw then pass together over the cylinder, the former falling through the wire-work F, F, while the straw is carried forward by the circular rakes G, H, and being by them thoroughly tossed and separated from the grain and chaff, is ejected at K. The grain which has fallen through the wire-work is received into a winnowing-machine, where it is cleansed from chaff, &c., and is then either discharged upon the barn-floor, or, as is the case with the most improved machines, is raised by a series of buckets fixed on an endless web, and again winnowed, to separate the perfect grains from the light and small seeds. Barley is, previous to the second winnowing, subjected to the process of 'hummelling,' by which the awns are removed; but the rest of the process is the same as above.

Since Meikle's invention, the improvements attempted on his mill have been chiefly confined to modifications of the drum; such as diminishing the distance between the drum and its cover, increasing the number of the beaters, and accelerating the speed of the drum (to about 800 revolutions per minute).

The portable thrashing-machine, so generally employed in England, is devoid of the two grooved rollers, the loosened sheaf being at once submitted to the action of the thrashing-machinery; the drum, which is a *high-speed drum* (sometimes cased with iron), is provided with six beaters, and its cover, which encloses about one-third of its circumference, is capable of being set at any required distance from it by means of screws. In this form of mill the straw revolves at once with the drum, and being rubbed between its beaters and the cover, the grain is effectually separated; hence this species of drum is frequently called the *rubbing-drum*. More work can be done by this machine than by Meikle's ordinary mill, but the machinery is more liable to be injured than when the fluted rollers are employed, as these latter, to a certain extent, regulate the 'feeding-in.' A modification of the latter machine has the drum wide enough to allow of the straw being fed in sideways; the cover encloses the machine for about three-fifths of its circumference; and the straw, after separation from the grain, is delivered by the rakes almost unbroken, and in a condition fit for being at once put up in *bolts*, or bundles, whence this species of drum is called a *bolting-drum*. The defects of this form are: the slowness of its operation, the corn requiring to be fed in thinly; the greater power required; and the increased tendency to clog, especially if the straw is somewhat damp. In another form, the drum is armed with rows of spikes projecting outwards for about 2½ inches, which revolve between similar rows of spikes on the interior of the cover; this kind thrashes effectually, but breaks and chops the straw much more than the other forms of drum.

The driving-power is either wind, water, horse-power, or steam; the first of which is so very uncertain and unequal in its operation, that it has now-a-days been mostly superseded by the others.

Water-power is always desirable, and when it can be had in sufficient quantity or regularly, which is but seldom, is much to be preferred to the others in point of economy, its mode of application to thrashing being either by the ordinary machinery of the Water-wheel (q. v.) or by *Barker's Mill* (q. v.). Horse-power was the agent in most common use

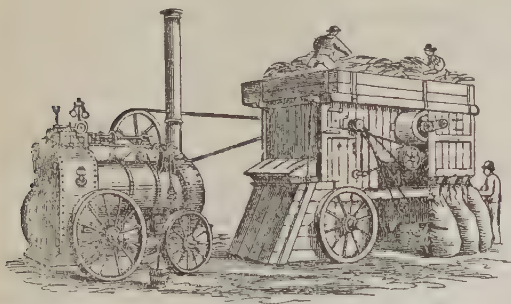


Fig. 2.

till recently, the horses being yoked to beams attached to a vertical revolving shaft which communicated motion by means of bevelled gear to the thrashing-machine. *Tread-power*, on an endless chain platform, is preferred to the *sweep-power*, as it can be used in restricted spaces, as barns, &c. At the present time steam-power, as being more economical, has in some districts superseded horse-labour, engines of 4—10 horse-power being generally employed. Portable thrashing-mills and engines are very generally employed in England and to some extent in the United States, being thought by many to be more economical. In the wheat-fields of the Mississippi Valley these machines are made to traverse the field, strewing the straw behind them and gathering the wheat into bags. The fixed machine is advocated by others on the grounds of the various additional uses that can be made of it, its diminished liability to derangement, and its greater cheapness. See *Transactions of the Highland Society*, March 1852.

THRA'SIMENE, Lake. See Trasimenus Lacus.

THREAD is an exceedingly small twine made by doubling and twisting several thicknesses of yarn so as to produce a strong and well-rounded line for sewing with, either of cotton, flax, or silk.

THREAD-WORMS. This term is employed by some zoologists to the whole order *Nematoda*—a word derived from the Greek, and signifying a thread-like form. Most writers, however, restrict it to the *Oxyuridæ*, which, in the early part of this work, have been included in the *Ascarides* (q. v.), but have been arranged in a separate family by Cobbold, who divides them into ten genera. Only one species, *Oxyuris vermicularis* (formerly known as *Ascaris vermicularis*) (q. v.), the small thread-worm, infests man, and is the commonest of the intestinal parasites.

THREATS, in a legal sense, are that kind of intimidation which has for its object to influence a person in abandoning or surrendering some legal right, or what is equivalent, paying money, to prevent some injury being done to him. When the threats are made by more than two persons, the offence usually assumes the form of Conspiracy (q. v.). In other cases, the usual form of the offence is the sending of a threatening letter—i.e. a letter either anonymous or otherwise—demanding money from the party addressed; otherwise, that he will be murdered, or his house will be burned, or he will be charged with some infamous crime. Whoever sends, or indirectly or directly, with knowledge of the contents, causes to be received, any letter or writing demanding, with menaces, or without any reasonable or probable cause, any property, chattel, money, valuable security, or other valuable thing, is held guilty of felony, and liable to penal servitude for life, or imprisonment for three years. And whoever demands such things with intent to steal the same, is also guilty of felony, with like punishment. So whoever sends a letter threatening to accuse a person of any crime, with a view or intent to extort money or gain any valuable security or property, is guilty of felony. Whoever threatens to accuse one of an infamous crime with intent to extort money, or gain some valuable property, is also guilty of felony. Whoever sends a letter threatening to burn or destroy any house, barn, building, stack of grain or hay, or to kill or wound cattle, is guilty of felony.

THREE KINGS, Feast of the, a famous medieval festival, identical with Epiphany (q. v.) or Twelfth Night, and designed to commemorate the visit of the three magi or wise men of the East (transformed by the mingled ignorance and reverence of the middle ages into great kings) to the infant Saviour. But the name is more particularly given to a kind of dramatic or spectacular representation of the incidents recorded in the 2d chapter of Matthew—as, the appearance of the wise men in splendid pomp at the court of Herod, the miraculous star, the manger at Bethlehem, the solemn and costly worship of the Babe—which was long very popular. In 1336, a peculiarly gorgeous representation was got up at Milan by the Preaching Friars. See Chambers's *Book of Days*, vol. i., page 62.

THRIFT (*Armeria*), a genus of plants of the natural order *Plumbagineæ*, having the flowers collected into a rounded head, a funnel-shaped dry and membranous calyx, five petals united at the base, five distinct styles, and five stamens attached to the base of the petals. By many botanists it has been regarded as a subdivision of the genus *Statice*, from which it is distinguished chiefly by having the

Common Thrift (*A. maritima*).

flowers in heads.—The Common Thrift (*A. maritima* or *vulgaris*) is a plant which grows in turf-like tufts, with linear leaves, scapes a few inches high, and beautiful rose-coloured flowers, an ornament of the

sea-coasts of Britain and of Europe generally, and also frequently found on high mountains. It is often planted in gardens as an edging, for which it is very suitable, being of a fresh green all the year, and exhibiting its fine flowers in profusion in July and August; but it requires to be renewed every two or three years, the smallest rootless sets growing, however, with great readiness in the moist weather of spring. The flowers are an active and useful diuretic. From two drachms to an ounce of the flowers freshly gathered and quickly dried, should be gently boiled, and the patient allowed to drink as much of the decoction as he pleases. Some aromatic, as anise or cinnamon, is added.

THRIPS, a genus of small insects of the order *Hemiptera*, sub-order *Homoptera*, allied to *Aphis* (q. v.), and included in the family *Aphidii* of some entomologists. The species are numerous, and widely distributed. They are very active, and some of them very troublesome, by the injury which they do to cultivated plants, upon the juices of which they live. When disturbed, although they use their wings, their motion resembles leaping rather than flying. The wings are much fringed. A common British species is *T. cerealium*, an insect not a line in length or in extent of wing, which resides in the spathes and husks of cereal grasses, particularly wheat and rye, in the beginning of summer, causing the grain to shrivel; and which at an earlier season of the year, causes the abortion of the ear by puncturing the stems above the joints. It is most injurious to late-sown wheat, probably because the plants are weak, and therefore easily injured, at the time when the *Thrips* abounds. The larva is deep yellow, part of the head and two spots on the thorax dusky. The pupa is pale yellow and active. The perfect insect is flat, smooth, and pitch-colour. The male is wingless, the female winged.

1, *Thrips cerealium; a*, natural size. 2, do. with wings extended; *b*, natural size.

THROAT, Affections of the. Common inflammatory sore throat has been already described in the article Quinsy; and other important throat-diseases, Aphthæ or Thrush, and Diphtheria, have also been discussed in special articles. The *malignant sore throat* of the older nosologists is now recognised as a modification of scarlatina. Another important variety of sore throat occurs as one of the forms of secondary syphilis. *Bronchocele* or *Goitre*, which, to a certain degree, is an affection of the throat, is specially described under the latter name.

The disease popularly known as *Clergyman's Sore Throat*, or *Dysphonia Clericorum*, and which is recognised in medicine under the name of *Follicular Inflammation of the Pharynx*, first shews itself by huskiness of the voice, with more or less coughing, hawking, and expectorating, from an uneasy sensation in the throat; there is, moreover, a constant inclination to swallow. On examining the back of the throat, its mucous membrane is seen covered with granulations, caused by an accumulation of secretion in the follicles, which sometimes burst and discharge their contents, which are of an elastic consistent nature. This discharge is occasionally followed by ulceration. The disease commonly arises from too prolonged or powerful exercise of the voice by persons in whom the mucous membrane of the throat is in a relaxed condition. Perfect rest from public speaking, preaching, acting, &c., is of more importance than anything else in the way of treatment, and a residence during the winter and spring in a mild and equable climate is expedient. Torquay, Ventnor, Nice, Mentone, Algiers, and Egypt, afford a choice of suitable residences. Tonics, such as iron, quinia, and strychnia (in small doses not exceeding $\frac{1}{20}$th of a grain, three times a day), should be tried; but the local application of a strong solution of nitrate of silver (from 20 to 80 grains in one ounce of distilled water), applied by a probang to the affected mucous membrane, is usually of far more service than internal remedies. The best work on this subject is that of Dr Horace Green, an American physician.

Passing over several throat-affections of minor importance, we proceed to the consideration of wounds in the throat. These wounds are comparatively seldom the result of accident; they are more often made with a murderous intent, and most frequently they are made with the view of committing suicide.

The first duty of the surgeon, in treating a case of cut throat, is to arrest the flow of blood. Ligatures should be applied to wounded arteries, and steady pressure with the finger (beneath which a small pad of lint is placed) to wounded veins, such as the external jugular. If the internal jugular is wounded, fatal hæmorrhage will very rapidly ensue, unless the wound is immediately plugged with small pieces of sponge, or pressure with the finger is maintained as long as necessary. With a knowledge of these means of checking hæmorrhage by pressure, an intelligent non-professional person may be the means of saving life. When the bleeding has completely ceased, but not till then, means may be taken for bringing together the edges of the wound. In most cases, sutures, or even adhesive plaster, are inexpedient and even dangerous, and it is best to keep the parts in simple apposition. 'The patient,' says Mr Gray, 'should be placed in bed in a moderately warm room, the shoulders well raised by pillows, and the head bent forward and retained in that position by a bandage, and the wound should be covered with a strip of wet lint or linen.'

THROMBO'SIS (derived from the Greek *thrombos*, a clot of blood) is a term originally suggested by Virchow, and was generally employed to designate an affection of the blood-vessels (either veins or arteries), which essentially consists in a coagulation of blood (forming a true clot) at a certain fixed spot. Under certain morbid conditions, the blood has a tendency to coagulate in its vessels during life, on the least provocation. Thus, slight pressure on the side of a vein will sometimes induce this coagulation, while in other cases it is due to inflammation of the tissues which surround a vein, or laceration of a vein (as when the placenta is expelled from the uterus). A clot thus formed in a vessel increases and extends from one to another, till it reaches and finally fills a large vessel. Clots of this kind occurring in veins have been noticed from the times of Ambrose Paré and Petit, who seem to have been the first to apply the term *thrombus* to them.

THRO'NDHJEM (Drontheim), the ancient Nidaros, and former capital of Norway, is situated in the Fjord of T., at the mouth of the little river Nid, 240 miles—direct line—north of Christiania; pop. (1875) 22,544. T., which consists of the old town, founded in 997, and the suburbs of Blakland and Ilen, is built on the picturesque and undulating slopes of the Nid-Elv. and has regular and broad

streets. The fortified islands of Munkholm and Christiansteen defend the capacious harbour, which is never closed by frost on the seaward side. Among the public buildings the most noteworthy are the Kongens-Gaard, or old palace, and St Olaf's Church, the remains of the old cathedral, or Christ Church, which was built in the 12th c. by Archbishop Oeysteen, who erected this noble Gothic pile on the site of the two early Christian churches which had been founded by Harald Haardrade and Olaf II. The fine western extremity of the nave was not completed till 1248. The body of the murdered St Olaf was preserved within a costly shrine in the chancel of Christ Church, which ranked as the metropolitan church of Norway, where the kings of Norway have been crowned since the time of Magnus V. (1164). T. is the seat of government for the province and of a bishopric, and has a public exchange, the principal national bank, a public library, museum, various literary and scientific institutions, an institution for the deaf and dumb, an insane asylum, &c. The chief articles of trade are fish, tar, deal, and copper, which is obtained from the neighbouring mines of Röros. Salted cod and herrings, which are found in large quantities at the entrance of T. Fjord, are important articles of export. Besides its shipping and coasting trade, T. is the centre of considerable manufacturing activity, and has good sugar-refineries, distilleries, &c. The environs of T. are picturesque, and its position is one of considerable attraction, notwithstanding the high northern latitude (63° 25′); while the numerous historical events with which it is associated render it one of the most interesting towns in the Scandinavian kingdoms. The preponderance of wooden houses has somewhat diminished of late years, and the local authorities are endeavouring to enforce the use of stone for building purposes, in consequence of the frequent occurrence of great fires.

THRONE (Gr. *thronos*), the chair of royalty, an ornamented seat raised above the level of the floor on which it stands, often covered with a canopy, and intended for the use of a sovereign or other potentate. From an early period the Asiatic monarchs are represented as enthroned: the same usage of a dignified chair set apart for the sovereign was adopted in Greece, where also it was customary to represent all the greater gods as enthroned. In the middle ages and modern times, the throne has been in all monarchical countries the chair occupied by the sovereign on state occasions. The name of throne was also given, in the early centuries of the Christian church, to the raised seat in the middle of the tribune behind the altar, where the bishop sat surrounded by his clergy. The throne is now a common metaphorical expression for sovereign power and dignity.

THROSTLE. See SPINNING.

THROW, the term applied in Mining to the amount of Dislocation (q. v.) in a vertical direction, produced by a fault in the strata.

THRUSH (*Turdus* or *Merula*), a genus of birds of the family *Merulidæ* or *Turdidæ*, having a bill of moderate size, straight, the upper mandible convex, its point compressed, notched, and slightly curved downwards, the gape furnished with a few hairs; the nostrils near the base of the bill, oval, partly closed by a naked membrane; the first feather of the wing very short, the third and fourth longest; the tarsus longer than the middle toe, the outer toe connected with the middle toe at the base. The species are numerous and widely distributed, some of them inhabiting temperate and even cold countries, and some found only in tropical regions. Some of them are birds of passage, as the fieldfare and redwing. Some are gregarious, particularly in winter, as the species just named; others live solitary or in pairs. The common British species are the Black-bird (q. v.), Fieldfare (q. v.), Redwing (q. v.), Ring Ouzel (q. v.), Song T., and Missel Thrush.—The SONG T., or THROSTLE (*T. musicus* or *M. musica*), the mavis of the Scotch, is smaller than

Song Thrush (*Turdus musicus*).

the black-bird, its whole length being not quite nine inches. Its plumage is brown, of various finely-mingled shades; the throat, sides of the neck, breast, and flanks yellowish, spotted with dark brown; the belly nearly white, with a few spots of dark brown; a dark brown streak, with a lighter brown streak over it, passing from the bill to the eye. It is found in all parts of Europe, but deserts some of the northern parts in winter, being thus partially a bird of passage. It remains all the year in Britain. It feeds on insects, worms, slugs, snails, berries, and seeds. It often makes its nest in the centre of a thick bush or shrub, and sometimes in an open shed. The eggs are usually four or five in number. The male takes part in the work of incubation, and is very attentive in feeding his mate whilst so occupied. The throstle is well known as one of the sweetest songsters of the groves. In captivity, it is easily taught simple airs.—The MISSEL T. (*T. viscivorus* or *M. viscivora*) is about 11 inches in entire length,

Missel Thrush (*Turdus viscivorus*).

and is the largest and strongest European species of the genus. The plumage is very similar to that of the Song Thrush. The tail is slightly forked, which is not the case in that species. The spots on the belly are more numerous, and black. The song is loud and clear, but not equal to that of the Song T. or of the black-bird. The bird delights in pouring forth its song from the very top of a tall tree. It also very often sings before or during wind and

rain, whence it has received the name of Storm-cock. Its nest is generally fixed in the fork of a tree. It is found in almost all parts of Britain where there are woods. Its range extends through great part of Asia; it is found in India.—The WOOD T. (*T. mustelinus* or *M. mustelina*) is abundant in North America in summer, as far north as Hudson's Bay, retiring to tropical and subtropical regions in winter. It is rather smaller than the Song T., and very similar to it. It is of a very shy and retiring disposition. It has a clear but very simple song, which is to be heard in the depths of the forest, far from the haunts of men. Several other species are found in North America. India has some.—A common West Indian species (*T.* or *M. leucogenys*) is familiarly known by the name of Hopping Dick, and is a general favourite from its bold, lively manners, and its sweet song. All the species are in esteem for the table, and the Song T. is much sought for this use in Italy in the season of ripe grapes, when it becomes very fat. Gardeners in Britain well know how troublesome thrushes are where numerous, from their avidity for cherries and small fruit.

THRUSH, known also as *Infantile Sore Mouth*, is essentially a disease of early infancy, although it may occur at any age. Its characteristic symptom is the presence of small roundish white specks or patches on the lining membrane of the cavity of the mouth and throat, on the surface of the tongue, the angles of the lips, &c. These patches, which are termed *aphthæ*, look like minute drops of tallow or fragments of curd, and are formed by elevated portions of epithelium covering a drop of serous fluid; and as the dead epithelium falls off, a raw surface, or a dirty ash-coloured spot, is left exposed. In thrush, crops of these little patches commonly succeed one another. These spots render the mouth hot and tender, in consequence of which the act of sucking is accompanied by difficulty and pain. In association with these local symptoms are indications of general constitutional disturbance, such as feverishness, drowsiness, sickness, flatulence, colicky pains, diarrhœa, &c. The stools are green and slimy, and not unfrequently acrid, as may be inferred from redness of the anus being a common symptom. The vomited matters are also green, and have a strongly acid smell, as also has the breath. The complaint sometimes seems to be the result of improper diet, if the child is being brought up by hand, or of unwholesome milk from a diseased or intemperate nurse; of bad ventilation, &c.; but in some cases the cause of the disease is not evident. The disorder usually lasts eight or ten days, and is only attended with danger when the local affection runs into a low form of gangrenous ulceration. As undue acidity of the stomach seems to be an almost general symptom, the diet should be carefully regulated, and mild *antacids* prescribed. Dr (now Sir Thomas) Watson specially recommends a mixture of 2 parts of dried carbonate of soda and 1 of gray powder (mercury with chalk), of which from three to five grains may be given thrice daily. As a local application to the patches, honey of borax may be applied with a camel-hair pencil; or a pinch of a mixture of powdered borax and loaf-sugar (1 to 8 or 10) may be placed occasionally on the tongue, and the infant allowed to spread it over the mouth.

THRUSH, or TRUSH, in the horse, consists in inflammation and ulceration of the sensitive surfaces within the frog, giving rise to a fœtid discharge, constituting unsoundness, and usually causing lameness. Want of cleanliness is the chief cause. Daily, when the horse returns to his stable, the foot should be washed out with soap and water, carefully dried, and the fissures filled with mineral tar. If amendment does not speedily ensue, a dressing of calomel should be substituted for the tar several times a week. Ragged or loose portions of the frog may be removed by the knife or scissors.

THUCY'DIDÉS, the great historian of the Peloponnesian War, born of the demus Halimus most probably in 471 B.C., is said to have been the son of Olorus and Hegesipyle, and connected with the family of Cimon. It is stated—on authority equally conjectural, however—that he was instructed in oratory by Antiphon, and in philosophy by Anaxagoras. Certain it is that, Athenian as he was, of good family, and resident in the most cultivated community in Greece, he must have enjoyed a most liberal education. He was further possessed, either by inheritance or by acquisition through marriage, of gold-mines in that part of Thrace lying opposite the island of Thasos. He left a son called Timotheus, and perhaps also a daughter, who is said by some scholars to have written the eighth book of his history. We know from himself that he was one of the sufferers from the terrible plague of Athens, and also one of the few who recovered. We have no direct evidence as to his having displayed in public the oratorical talent which he reveals in his history; but it is certain that he held military command, and that he had under him an Athenian squadron of seven ships at Thasus, 424 B.C., when Eucles, who commanded in Amphipolis, solicited his assistance against Brasidas. The expected arrival of a superior force induced Brasidas to offer Amphipolis favourable terms, which were accepted. T. arrived on the evening of the same day on which Amphipolis had surrendered; and though he prevented Eion, at the mouth of the Strymon, from falling into the enemy's hands, still his failure to save Amphipolis caused him to be sent into exile, probably to avoid the severer punishment which his enemy Cleon, then so popular with the Athenians, was designing for him. Where his exile was spent, is not known. Probably he lived a good deal in the Peloponnesus, if not also in Sicily, as has been inferred from his minute descriptions of Syracuse and its neighbourhood. According to his own account, he lived in exile twenty years, and probably returned to Athens about the time when Thrasybulus liberated it, in the beginning of 403. Ancient authorities are all agreed that his end was a violent one, though whether it occurred at Athens or in Thrace, we have no means of ascertaining. The year of his death is generally fixed at 401. Uncertainty also prevails as to the time when he wrote his history. He is supposed, from hints supplied by himself, to have kept a register of the events of the war, from its outbreak to its close. His great work, chronologically divided into winters and summers—each summer and winter making a year—was subsequently re-arranged, probably by Alexandrine critics, into the books and chapters as we now have it; and of these books the eighth (and last) is supposed either to have not been written by him, or to have not received the same careful revision which he bestowed on the previous seven. There is hardly a literary production of which posterity has entertained a more uniformly favourable estimate than the history of Thucydides. This high distinction he owes to his undeviating fidelity and impartiality as a narrator; to the masterly brevity of his style, in which he is content to give in a few simple yet vivid expressions the facts which it must have often taken him weeks or even months to collect, sift, and decide upon; to the sagacity of his political and moral observations, in which he shews the keenest insight into the springs of human action, and the mental nature of man; and to the unrivalled

descriptive power exemplified in his account of the plague of Athens, and of the Athenian expedition to Sicily. Often, indeed, does the modern student of Greek history share the wish of Grote, that the great writer had been a little more communicative on collateral topics, and that some of his sentences had been expanded into paragraphs, and some of his paragraphs into chapters. But this want cannot have been felt by the contemporaries of T., while the fate of other ancient historians warns us that had his work, like theirs, been looser in texture, or less severely perfect, it would not have survived, as it has done, the wearing influence of time, or remained, in its own language, the *ktema es aei*—the 'possession for ever'—it has proved to the world. The best editions are those of Poppo (11 vols., Lps. 1821—1840), of Krüger (2 vols., Berl. 1846—1847), and—at least for historical illustration—of Arnold (3 vols., Oxford, 1830—1835). It has been admirably translated into English by the Rev. Thomas Dale.

THUG (from the Hindustani *thaga*, deceive; hence, literally, a deceiver, a cheat) is the name of a religious fraternity in India, which, professedly in honour of the goddess Kâlî, the wife of S'iva, is addicted to the committal of murders, and chiefly lives upon the plunder obtained from its victims. The name of Thugs is that by which this fraternity is generally known among Europeans in the more northern parts of India. In some provinces to the southward, they are called *Phansigars*, or 'stranglers' (from the Hindustani *phansi*, a 'noose'). In the Tamil language, their name is *Ari Tulukar*, or 'noosers;' in the Canarese, *Tanti Kalleru*, or 'thieves who use a cat-gut noose;' and in Telugu, *Varla Vandla*, or 'people who use the noose.' In the south of India, they used to live under the protection of the native chieftains, who, on the consideration of a settled contribution, and probably also of a share in the result of their depredations, connived at their practices, which, to the uninitiated, were generally concealed under the guise of an honest industry, especially that of the culture of land.

The proceedings of the Thugs are generally these: Banding together in gangs of from ten to fifty, but sometimes also of a much greater number, they assume the appearance of ordinary traders, travelling, if enabled to do so by their wealth, on horseback, with tents, and all the comforts of opulent merchants; but if this be not possible, also in more humble characters. Each gang has its *Jemadar*, or leader; its *Guru*, or teacher; its *Sothas*, or entrappers; its *Bhuttotes*, or stranglers; and its *Lughaees*, or grave-diggers. On arriving at towns or villages, they pretend to meet by accident, and to have no previous acquaintance with one another. Some of the gang are then employed as emissaries to collect information; and when learning that any persons of property are about to undertake a journey, they endeavour to insinuate themselves into their confidence, and usually propose to them, under the plea of safety, or for the sake of society, to travel in their company; or else, they follow them, waiting for the proper opportunity of carrying out their murderous work. The latter is generally perpetrated by throwing round the neck of the victim a rope or cloth, which one of the gang holds at one end, while the other end is seized by an accomplice; and while the two Thugs draw the noose tight, and press the head of their victim forwards, a third seizes him by the leg, thus causing him to fall to the ground. The fatal injury is then easily inflicted. Travellers staying in the same choultry, or public resting-place, are sometimes murdered in the night. In attacking a traveller on horseback, generally one of the gang goes in front of the horse, while another keeps himself in the rear; a third, walking by his side, when finding him off his guard, suddenly seizes him by the arm, and drags him to the ground; the sufferer is then strangled in the usual manner. Three Thugs are therefore generally required to murder one man; two, at the least, are thought necessary—for to strangle a man single-handed is a rare occurrence, and a feat of this kind is esteemed by the fraternity a most honourable distinction, which goes far to ennoble, in the eyes of his fellows, the Thug who has accomplished it, and even his family, for many generations. After the murder is perpetrated, the body of the victim is generally mutilated, in order, it seems, to expedite its decomposition, and thus to guard against discovery. For the same reason, care is taken to inter the body at a spot where it is not likely to be found; and thus it could happen that entire parties of travellers were destroyed, and not a vestige of them was discoverable. The indiscriminate slaughter in which the Thugs seem to indulge, is to a certain extent restrained by superstition; thus, it is deemed unlucky to kill certain classes and castes; and, as a rule, the female sex is exempt altogether.

The mode of dividing the plunder is probably various. According to one account, 'a portion of it is usually appropriated to defraying the expenses of religious ceremonies; and sometimes a part was also allotted for the benefit of widows and families of deceased members of the gang. The residue of the booty being divided into several parts, was generally shared as follows: To the leader, two shares; to the men actually concerned in perpetrating the murder, and to the person who cut the dead body, each one share and a half; and to the remainder of the gang, each one share.'

The practice of Thugs is not restricted to adventures on land. The rivers of India also are infested by bands of these robbers, who have similar habits to those of the land Thugs. They generally go in considerable parties—the one assuming the dress of travellers of respectability, the others acting as boatmen. When going up the river, they always pretend to be men going on pilgrimage to Benares, Allahabad, or some other sacred place; when going down, they pretend to be on their way home from such places. The travellers intended for their victims are inveigled on the high-roads, and murdered inside the boat, while some of the gang above sing and play. At a signal given by these that all is clear, the bodies of the murdered men are thrown into the river.

The patron goddess of the Thugs is Devî or Kâlî, the wife of the god S'iva, and the deity of destruction. In her name they exercise their profession, and to her they ascribe its origin. Formerly, they believe, Kâlî co-operated with the Thugs, and assisted them in the disposing of the bodies of their victims by devouring them. But through an indiscretion of one of the fraternity, who, out of curiosity, pried into the proceedings of the goddess, she became displeased, and condemned them in future to bury their victims. But though she now refused her future assistance, she presented her worshippers with one of her teeth for a pickaxe, a rib for a knife, and the hem of her lower garment for a noose. Whether on the faith of this legend or otherwise, it is certain that the pickaxe is the instrument which, by all the Thugs, is held in the highest estimation. Its fabrication is superintended with the greatest care, and it is consecrated to its duties under many and minutely regulated ceremonies; and after it has thus been prepared, it is only intrusted to a Thug selected for this dignity on account of his shrewdness, caution, and sobriety. The place where, and the manner in which, it is

then deposited are likewise the subject of the strictest rules; and it is submitted to special purifications after each time that it has been used for the preparation of a grave. The pickaxe is, in short, looked upon with the highest reverence by a Thug; it is the symbol of his faith, and the chief object of his superstitions. That these superstitions are gross and numerous, may be easily anticipated. The belief in omens especially, plays a great part in a Thug's career. All his movements are regulated by it, and the learning of the Thugs consists in a thorough acquaintance with them.

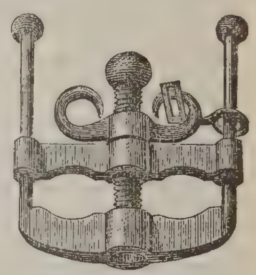
To a neglect of the warnings given by omens, or to an imperfect acquaintance with them, the Thugs invariably ascribe a failure of their undertakings, if it happens. When preparing for an expedition, the auspices are always solemnly taken; and only if favourable it is carried out. Among the bad omens, they count the meeting the corpse of any one belonging to the village, the meeting an oil-vendor, a carpenter, a potter, a dancing-master, a lame or blind man, a fakeer with a brown waistband, or a Hindu devotee with long traced hair. To sneeze is a bad thing at setting out on an expedition; to meet a woman with an empty pitcher, or an ass braying from the front, a pair of jackals crossing the road in front of the gang, to see a wolf cross the path from left to right. On the other hand, it is a lucky omen to meet a woman with a pitcher full of water, or a pregnant woman, or to hear an ass braying on the left while halting at a stage, or to see a single jackal passing from right to left, or an antelope from left to right. Superstitions like these—and it is not necessary to give more instances of them—sufficiently shew that the Thugs consider their murderous practices as countenanced and regulated by higher powers; and it is for the same reason that after every murder they perform a special solemnity called *Tapuni*. It is celebrated in honour of the terrific Kâlî, and its principal feature consists in addressing a prayer to the goddess, and in making the practical stranglers, those who formed part of the expedition, and committed the murders, partake of *gaur*, or consecrated sugar, the effect of which is believed to be irresistible. Other ceremonies are, of course, likewise performed on the occasion; but it is from the eating of the gaur that the strength and prosperity of the Thug are supposed necessarily to be derived. Another feast observed by the Thugs throughout India is called *Kurhae Karna* or *Kote*. It likewise takes place in honour of Kâlî, and the requisites for its celebration are goats, rice, ghee (butter), spices, and spirits. The superstitions of the Thugs are all of Hindu origin; but they are adopted also by the Mohammedans, who, while stout adherents to the tenets of the Koran, yet pay divine honours to the Hindu goddess of destruction. This inconsistency they sometimes reconcile by identifying Kâlî, whose other name is also Bhavânî, with Fatima, the daughter of Mohammed, and wife of Ali, and by saying that Fatima invented the use of the noose to strangle the great demon Rukutbeejdana.

At various periods, steps were taken by the native and English governments to suppress Thuggee—the practice of the Thugs—but it is only since 1831 that energetic measures were adopted by the British authorities to counteract the evil; and though it has not yet altogether disappeared, it may be safely assumed that it is fast dying out.—For a fuller account of the Thugs, the reader is referred to the *Illustrations of the History and Practices of the Thugs* (by E. Thornton, Lond. 1837)—whence the foregoing outline is taken; to the authentic reports of special cases contained in the same work; and to Meadow's *Confessions of a Thug* (Lond. 1840).

THU'JA. See ARBOR VITAE.

THU'LÉ, the name generally given by the ancients to the most northerly part of Europe known to them, and in the description of which fancy played a conspicuous part. According to Pliny, it was an island in the northern ocean, discovered by the navigator Pytheas, who reached it after six days' sail from the Orcades. The name T. appears to be merely a classic form of the Gothic *Tiel* or *Tiule*, 'remotest land' (comp. Gr. *telos*, a goal); and most modern geographers identify T. with Iceland. Some, however, prefer to seek for it in that part of Norway called *Thil* or *Thilemark*, or in Jutland, the extremity of which is known as *Thy* or *Thyland*. Ptolemy considers that Mainland, the principal member of the Shetland group, has the best claim to being regarded as the T. of Pytheas.

THU'MBIKINS, or THUMBSCREW, an instrument of torture for compressing the thumb, largely made use of by the Inquisition in Spain, and also occasionally used in England, when examination by torture was practised there. The last instance of its application in Britain was in the case of Principal Carstairs, on whom this mode of torture was inflicted for an hour and a half at Holyrood by the Scottish Privy Council, with the view of obtaining from him confession of the secrets of the Argyll and Monmouth parties, but without effect in producing any disclosures.



Thumbscrew.
(From an instrument in the Antiquarian Museum, Edinburgh.)

THUN, a picturesque and ancient town of Switzerland, in the canton of Bern, 17 miles south-south-east of the city of that name. It stands on the Aar, one mile from the Lake of Thun, out of which the river rushes past the town in a stream of crystal clearness. The old castle of the 12th c. with its corner towers, and the venerable church, are the chief buildings. T. is the starting-place for those who visit the Bernese Oberland, and is consequently visited by crowds every season. Pop. 3800.

THUN, LAKE OF, in the canton of Bern, Switzerland, between the town of Interlaken on the east, and that of Thun on the north-west; is 10 miles long, 2 miles broad, 1775 feet above sea-level, and in some places between 700 and 800 feet deep. The scenery is very attractive. Steamers ply on the lake, and there is a good post-road along the south shore.

THUNDER. See LIGHTNING.

THU'NDERBOLT, in Heraldry, a bearing borrowed from classical mythology, which may be described as a twisted bar in pale inflamed at each end, surmounting two jagged darts in saltire between two wings displayed with streams of fire.

Thunderbolt.

THU'RGAU (i. e., valley of the Thur), a frontier canton in the north-east of Switzerland, bounded on the N.-E. by the Lake of Constance, and on the W. and S. by the cantons of Zürich and St

Gall. Area, 384 sq. m.; pop. about 100,000. The surface, unlike that of the other cantons of the country, is undulating or hilly, but nowhere mountainous, the chief height being the Hörnli in the extreme south, 3605 feet. The principal river is the Thur, from which the canton derives its name, and which, flowing west-north-west through a broad valley, joins the Rhine in the canton of Zürich. The soil is fertile in the ordinary crops, and remarkably so in fruits—large tracts of open country being laid out in orchards, as well as vineyards. Three-fourths of the inhabitants are Protestants. Capital, Frauenfeld.

THU'RIFER (Lat. *thur*, incense, and *fer-*, to carry), the ministering attendant in the Roman Catholic Church, at solemn mass, vespers, and other solemn ceremonies, whose duty it is to carry the *thurible*, or incense-vessel, and either to minister incense (q. v.) himself, or to present the thurible to be used for that purpose by the officiating priest. The office of thurifer is one of those which belong to the so-called 'Minor Order' of *Acolyte*. See ORDERS. The thurible now in use consists of a metallic vessel for holding burning charcoal, commonly of silver or silver-plated, but occasionally also of gold, with a movable cap, and suspended from four chains, so as to be capable of being freely waved about in the air for the readier dispersion of the smoke of the incense which is thrown upon the live charcoal.

THU'RINGER-WALD (forest of Thuringia) is a considerable mountain-range of Central Germany, which extends from the junction of the rivers Werra and Horsel, near Eisenach (q. v.), in a south-east direction to the north of Bavaria, where it joins the Frankenwald, a ramification of the Fichtel-Gebirge. Its total length is about 50 miles, and its highest summits are Schneekopf (3400 feet), Gross-Beerberg (3435 feet), Inselberg (3222 feet), and Finsterberg (3209 feet). The range is composed mostly of granite, porphyry, and argillaceous schists, abounding in metallic veins, among which iron ore is most conspicuous, though many others are found more or less plentiful; and auriferous sands occur in some of the rivers which have their source here. The T. is parcelled out among the states of Weimar, Meiningen, Coburg-Gotha, Prussia, Schwartzburg, Reuss, and Hesse-Cassel.

THURI'NGIA (Ger. *Thuringen*), the name still borne by that part of Upper Saxony which is generally bounded by the Werra, the Saale, and the Harz Mountains, though it has no longer any distinct terminal significance. The country was so called from the people Thuringii (probably the descendants of the Hermunduri), who were found inhabiting it in the 5th c.

THURLES, a market-town and seat of a poor-law union, in the county of Tipperary, province of Munster, Ireland. It is a place of great antiquity, and is celebrated not only in the bardic history, but also as the scene of a great battle with the Danes. It is situated on the river Suir, 52° 42′ N. lat., 7° 47′ W. long., 86 miles south-west from Dublin, with which city, as well as with Cork, it is connected by the Great Southern and Western Railway. The population is about 4500, of whom nearly all are Roman Catholics. T. being the seat of the Roman Catholic archbishop, has two convents of nuns, a monastery of Christian Brothers, and a college for ecclesiastical and general education, numerously attended.

THURLOW, EDWARD, LORD, an English lawyer, was born, in 1732, at Little Bracon-Ash, in Norfolk. His father, a clergyman, sent him to school at Canterbury, where he obtained a sound knowledge of the Latin and Greek classics. Thence he proceeded to Cambridge, but in his zeal, it is said, to affect the character of an idle clever boy, he committed breaches of discipline which compelled him to leave the university. He became a student of the Inner Temple, and was called to the bar in 1754. He was a fellow-pupil, in a solicitor's office, with the poet Cowper, and still affected idleness, although, in reality, he worked hard to make himself a good lawyer. His lofty stature, strongly marked features, dark eyes bushy eyebrows, and look of self-possession and wisdom, led, it appears, every one with whom he came in contact to attribute to him qualifications he really did not possess. His gifts, however, were those which are most likely to insure early success at the bar. An accidental meeting, at a coffee-house, with the Scotch solicitors in the great Douglas case, led to his employment in it as junior counsel, and to his acquaintance with the members of the Douglas family. It was one of them, the Duchess of Queensberry, who, by her influence with Lord Bute, obtained for him, in 1761, the rank of King's Counsel. After this period, he acquired a still higher reputation by his speech in the Douglas case —the greatest effort of his life. In 1768, he was returned for Tamworth, and became a zealous supporter of Lord North. When, in 1771, he was appointed Solicitor-general, he attracted the special notice of George III. by the zeal he displayed in supporting the American policy of the government. In 1778, he was raised to the woolsack; and such was his influence with the king, that he was allowed, contrary to all precedent, to retain the office under the Rockingham administration. He caused great embarrassment by opposing all the measures brought in by that government. Under the coalition ministry, he was compelled to retire; but he was restored as Chancellor on Mr Pitt coming to power. For a time he supported the government; but relying again on the support of the king, he once more began to give trouble, and ventured to oppose the measures his colleagues brought forward. Pitt then intimated that he or T. must retire, and the king, without any hesitation, consented to his removal (1792). T. sank into comparative obscurity. He amused himself in reading the Latin and Greek classics with his nephews, and spent much of his time in visiting and receiving visits. He died at Brighton on September 12, 1826. Lord Campbell, in his excellent life of T., says he can find nothing recorded of him to justify the great reputation for ability he had among his contemporaries, and ascribes it chiefly to his assuming manner; but it must be recollected that he had no Boswell to record his talk, and that it was his conversation which was admired. Johnson would not have said of an ordinary person as he did of him: 'I would prepare myself for no man in England but Lord Thurlow. When I am to meet him, I should wish to know a day before.'

THU'RSDAY (Swed. *Thorsdag*, Ger. *Donnerstag*), the fifth day of the week, is so called from Donar or Thor (q. v.), who, as god of the air, had much in common with the Roman Jupiter, to whom the same day was dedicated (Lat. *Jovis dies*, Fr. *Jeudi*).

THU'RSO, a burgh of barony, seaport, and market-town on the north coast of Caithness, 20 miles north-west of Wick. It is irregularly built, but contains some handsome freestone houses, and two handsome churches. Thurso Castle, to the east of the town, is a fine venerable structure. The harbour is a safe one for vessels not over 150 tons burden. At Scrabster, on the west side of the bay, a steamer calls weekly, and there is a good roadstead with a pier. Ropes are manufactured; and cattle, grain, sheep, and paving-stones exported

The marine views from T. are exceedingly striking. Pop. about 4500.

THWARTS, in a boat, are the cross-benches on which the rowers sit.

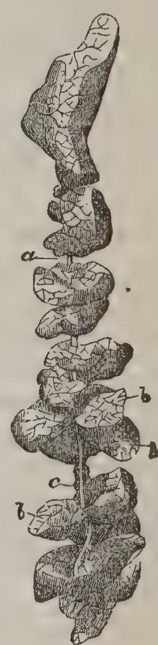
THY'LACINE (*Thylacinus*), a genus of carnivorous marsupial quadrupeds, nearly allied to opossums and dasyures. The muzzle is elongated, and somewhat dog-like. The tail is long and tapering. Only one species is known (*T. cynocephalus* or *Harrisii*), native of the mountainous parts of Van Diemen's Land, where it inhabits the wildest glens, but issues from them to prey on the sheep of the colonists, by whom it is commonly called the wolf, or tiger-wolf, and is destroyed by all possible means. Kangaroos, echidnæ, &c., seem to have been its ordinary prey before sheep were introduced. It is of the size of a large dog, and is the most powerful of Australian carnivorous quadrupeds. It is very active and fierce. It is not known to exist except in Van Diemen's Land.

THYME (*Thymus*), a genus of humble half-shrubby plants, of the natural order *Labiatæ*, having a two-lipped calyx, and four diverging stamens. GARDEN T. (*T. vulgaris*) is 6—10 inches high, with narrow almost linear leaves, and whitish or reddish flowers, which grow in separate whorls, six in a whorl. It is common upon dry hills in the south of Europe, and is very commonly cultivated in gardens, on account of its fragrance.—WILD T. (*T. Serpyllum*) has a procumbent stem with many branches, 2—3 feet long, oval leaves and purplish flowers, arranged in whorls, which are united in a head. It is abundant on hills and mountains in Britain, and in all parts of Europe, and the north of Asia. It is less fragrant than Garden T., but both species contain an aromatic essential oil. The flowering branches (*Herba Thymi* and *Herba Serpylli*) are used in medicine as a powerful stimulant, and those of Garden T. are also used in cookery for flavouring.—The LEMON T., or Lemon-scented T. of our gardens, is regarded as a variety of *T. Serpyllum*. It is generally of still lower growth than the common Garden Thyme.—No species of T. is indigenous in America.

THYMELEA'CEÆ, a natural order of exogenous plants, of which the Mezereon and Spurge Laurel (see DAPHNE) are familiar examples. This order consists chiefly of shrubs, with a few herbaceous plants, and contains about 300 species, natives chiefly of the warmer temperate countries. The leaves are undivided. The perianth is inferior, tubular, coloured, 4-cleft, or rarely 5-cleft, sometimes with scales in the orifice. The stamens are perigynous, often eight, sometimes four, and less frequently two. The ovary is one-celled, and the fruit one-seeded, either nut-like or a drupe. The bark is generally fibrous and tough. That of *Gnidia daphnoides* is used in Madagascar for ropes, and that of *Lagetta lintearia*, or Lace-bark, in the West Indies for whips. The bark of some species of *Daphne* and nearly allied genera is made into paper in the East. See DAPHNE. Poisonous properties prevail in the order. The bark is in general very caustic, and that of some species is used as a vesicatory, and for other medicinal purposes.

THY'MIC ASTHMA. See THYMUS GLAND.

THY'MUS GLAND, or simply the Thymus (Gr. *thymos*, sweet thyme, because the gland was compared to the flower of this plant by Galen), one of those structures which, like the spleen, supra-renal capsules, and thyroid gland, are placed amongst the ductless glands. It is a temporary organ, and is commonly stated to attain its greatest development in relation to the rest of the body during the latter part of fœtal life. 'But this,' says Dr Carpenter, 'is a mistake, for the greatest activity in the growth of this organ manifests itself in the human infant soon after birth, and it is then, too, that its functional energy seems the highest. This rapid state of growth, however, soon subsides into one of less activity, which merely serves to keep up its proportion to the rest of the body; but its increase is continued till the age of puberty is attained.'—*Principles of Human Physiology*, 6th ed., p. 143. After remaining stationary for some years, it gradually assumes, in well-nourished persons, the characters of a mass of fat. On examining the gland when its growth is most active, it is found to consist of two lateral lobes placed in contact along the middle line, extending from the lower border of the thyroid gland to the cartilage of the fourth rib, and covered by the sternum and by the margins of the muscles passing upwards from the top of that bone. The gland is of a pinkish gray colour, soft and lobulated on its surfaces; and by careful manipulation it may be shewn to consist of an assemblage of hollow glandular lobules, united together by connective tissue, all their cavities communicating with a central reservoir or main canal, from which there is no outlet. This arrangement is well seen in the accompanying diagram of a portion of the thymus gland of a calf. The thymus is about two inches in length, one and a half in breadth, and four lines thick, and at birth it weighs about half an ounce; its chemical constituents are water, albumen, gelatine, sugar (?), fats, leucine, sarkine, xanthine, and formic, acetic, succinic, and lactic acids, besides the ordinary inorganic salts—the number of the ingredients, many of them of rare occurrence elsewhere in the body, indicating that important chemical changes take place in their structure. Its exact uses are unknown, but like the other ductless or vascular glands, it doubtless plays some important part in the preparation and maintenance of the blood. The albuminous nature of the juice of this gland, and the finely granular appearance it presents, indicate that a material is here being prepared which is to be rendered subservient to nutrition; and various facts which have been noticed in regard to its changes of bulk (especially its rapid diminution in over-driven lambs, and its subsequent gradual redistention during rest, if plenty of food is given) strongly confirm these views.



Portion of Thymus of Calf, unfolded:

a, main canal; *b*, glandular lobules; *c*, isolated gland-granules seen in the main canal.

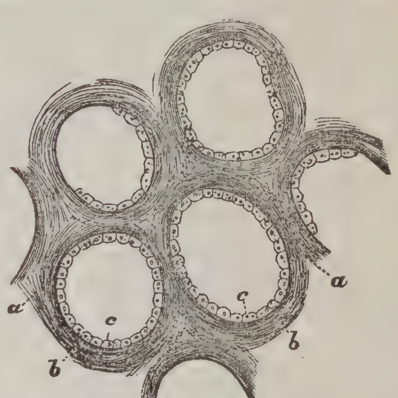
The anatomy, physiology, and development of this gland have occupied the attention of three of the most celebrated writers of the present century: see Sir Astley Cooper's beautiful monograph, *On the Anatomy of the Thymus Gland*, 1832; Mr Simon's

Physiological Essay on the Thymus Gland, 1843; and Professor Goodsir's Memoir 'On the Development of the Thymus Gland,' in the *Philosophical Transactions* for 1844.

The only disease of this structure requiring notice is hypertrophy—a condition which was supposed occasionally to induce suddenly fatal dyspnœa (breathlessness) in children. There are, however, sound reasons for believing that there is no essential connection between the glandular enlargement and the suffocative paroxysms; because (1) the affection termed *thymic asthma* may occur with an abnormally *small* thymus; and (2) when a thymus, enlarged by malignant disease (encephaloid, for example) does occasion dyspnœa, it is not sudden and paroxysmal, but constant in its nature. The disease is known under various other names, as *Laryngismus stridulus*, *spasmodic croup*, and *child-crowing*. This *bastard croup*, as Dr Watson calls it, is far more common than true croup, and is very liable to be confounded with it. 'In their most obvious symptoms, the two affections are much alike. The broad and essential difference between them is the absence in the spurious disorder of inflammation and of fever, and consequently of any concrete or other effusion from the mucous membrane of the air-passages. The child is seized all of a sudden, roused perhaps from its sleep, or checked in the act of sucking, by a catch, or interruption of its breathing, more or less complete. It strives and struggles to inspire, but is apparently unable to do so; at length, the effort is successful, and the breath is drawn in with a shrill whistling or crowing sound, like that which characterises the inspirations of croup or of hooping-cough, and depending, no doubt, upon the same cause—a narrowing (in this complaint, temporary) of the fissure of the glottis.'—*Lectures on the Principles and Practice of Physic*, 4th ed. vol. i. p. 866. The more complete the closure of the chink of the glottis is, the more intense will be the symptoms. In severe cases, the countenance becomes livid, the eyes fixed, and there is an entire suspension of the respiratory function for a while. The child makes vehement struggles to recover its breath, and at varied intervals, from a few seconds up to a minute or longer, air is admitted through the glottis, now partially open; and this rush of air produces the characteristic sound. A fit of coughing or crying then often supervenes, and the attack terminates with some exhaustion. If, however, the glottis does not partially open, the child will die suffocated (or in popular language, *in a fit*) at the end of two, or at most, three minutes, falling back pallid and exhausted in its nurse's arms. In association with these symptoms, is often a contracted state of the flexor muscles of the thumb, fingers, toes, wrist, and ankle, giving to the foot an appearance like that of club-foot. It has been observed by Dr Ley, who has written a volume on this disorder, and other observers, that there is a frequent connection between child-crowing and certain other affections, as (1) tumefaction of the glands in the neck and chest, and entanglement of the pneumogastric nerve or its branches among these glands; (2) painful dentition, which is apt to produce glandular swellings of the neck; and (3) excoriations behind the ears, and inflamed and irritable scalp, which also occasion enlargement of the glands. The nerves passing from the enlarged gland to the nervous centre convey the sensation of irritation; and the inferior laryngeal nerve, which supplies nearly all the muscles of the larynx, acts on the efferent or motor nerve, and excites spasmodic contraction of the muscles closing the aperture of the glottis. Hence the phenomena are those of Reflex Action.

During the paroxysm, the warm bath may be tried, if it can be got ready at once. The application of hot fomentations to the throat by means of a large sponge, is often very serviceable, and is usually more accessible than the bath. The muscles sometimes relax when cold water is freely sprinkled over the chest and face, and these simultaneous applications of hot and cold water are by no means incompatible. The subsequent general treatment must depend upon the exciting cause, on the painful dentition, the eruption of the head, &c. The state of the bowels and of the skin must always be carefully regulated, and change of air is always advisable. Phosphate of lime, in doses of from five to ten grains, three times a day, administered in chalk mixture, has been strongly recommended by Dr W. Budd in this disease, and is well deserving of a trial.

THY'ROID BODY or GLAND (Gr. *thyreos*, a shield, and *eidos*, like), one of the ductless or vascular glands, lying at the upper part of the trachea, and consisting of two lateral lobes, placed one on each side of this canal, and connected together by a narrow transverse portion at the lower third, called the isthmus. It is of a brownish red colour, and its normal weight is about an ounce, but it occasionally becomes enormously enlarged, constituting the disease called bronchocele or goitre. Each lobe is somewhat conical, and is about two inches long and three-quarters of an inch broad. The thyroid body differs from the other vascular glands in structure, for it 'consists of an aggregation of



Group of Gland-vesicles from the Thyroid Gland of a Child:
a, connective tissue; *b*, membrane of the vesicles; *c*, epithelial cells.

closed vesicles (*b*, *b* in the figure), which seem to be furnished with a true limitary membrane, and therefore to be real gland vesicles embedded in a stroma (*aa*) of connective tissue, and not communicating with any common reservoir. These bodies vary in diameter in the human subject from $\frac{1}{1000}$th to $\frac{1}{80}$th of an inch; and they contain an albuminoid plasma, which is either faintly granular or of a somewhat oily aspect, amidst which are seen a number of corpuscles, the greater part of them in the condition of nuclei, while some have advanced to that of cells.'—Carpenter's *Principles of Human Physiology*, 6th ed., p. 143. The thyroid body is abundantly supplied with blood by the superior and inferior thyroid arteries, which continue subdividing, till they ultimately form a very minute

capillary plexus upon the limitary membrane of the vesicles. This body, like the thymus and supra-renal capsules, is relatively larger in the fœtus and during infancy than in after-life.

From the investigations of Mr Simon (see his Memoir on the 'Comparative Anatomy of the Thyroid,' in the *Philosophical Transactions* for 1844), it appears that a thyroid is present in all mammals, birds, reptiles, and amphibians, and that he has discovered it in many fishes. Its presence in some of the fishes in which Mr Simon observed it, has, however, been called in question by Dr Handfield Jones (see his article 'Thyroid Gland' in the *Cyclopædia of Anatomy and Physiology*).

Mr Simon has propounded a theory regarding the function of this gland which is certainly ingenious, and probably correct. Basing his theory on the circumstance, that the thyroid arteries arise in close proximity to the cerebral, he considers that the thyroid gland acts as a diverticulum to the cerebral circulation, exercising at the same time its secreting function in an alternating manner with the brain.

Little need be said here regarding the diseases of this organ, as the most important of them, bronchocele or goitre, has been already described under the latter title.

THY'RSUS, in Botany, a Panicle (q. v.), in which the flower-stalks are short, and the flowers are thus close together, so that the panicle is dense. It is a very common form of inflorescence. The use of the term is, however, somewhat vague.

THYSANU'RA, an order of wingless insects of small size, and which undergo no metamorphoses. They are furnished with peculiar organs, either along their sides or at the extremity of the abdomen, which, as well as the legs, are used for locomotion. The whole order is comprised in two families—*Poduridæ*, or Spring-tails (see PODURA), and *Lepismidæ*. The *Lepismidæ* have an elongated body, covered with small shining silvery scales. The abdomen is furnished on each side with a series of movable appendages; it has also at its extremity a compressed appendage of two pieces, and three jointed bristles, which are used in leaping. The *Lepismidæ* inhabit dark and moist places, as behind window-shutters, beneath planks, &c.; many of them often in the interior of houses.

TI (*Cordyline Ti*, formerly *Dracæna terminalis*), a plant of the natural order *Liliaceæ*, and nearly allied to the Dragon Tree. See DRAGON'S BLOOD. It is found in the south-east of Asia, the Eastern Archipelago, the Sandwich Islands, and many other island groups of the Pacific Ocean. It attains a height of ten or twelve feet, sometimes more, with a tree-like form, lanceolate leaves of a reddish hue, and branching panicles. The fruit is a three-celled and three-seeded berry. The leaves afford food for cattle. They also form durable thatch for houses. Their fibres are sometimes made into cloth. It is most valuable, however, for its root, which is very large, and when raw, is hard, fibrous, and almost insipid; but becomes soft and sweet when baked—is very nutritious, and much used as an article of food. Good sugar is also made by evaporating its juice; the fermented juice is used as an intoxicating beverage, and a kind of ardent spirit is distilled from it.

Tiara.

TIA'RA, the triple crown of the pope, which is considered to be symbolical of his temporal, as the keys are of his spiritual authority. It is composed of a high cap of gold cloth, encircled by three coronets, with a mound and cross of gold on the top. From the cap hang two pendants, embroidered and fringed at the ends, and semée of crosses of gold. The original papal crown consisted of the cap alone, and was first used by Pope Damasus II., 1048 A. D. The cap was surrounded with a high coronet by Boniface VIII. in 1295; the second coronet was added in 1335 by Benedict XII.; and the third by John XXIII. in 1411.

TI'BER, the chief river of Central Italy, and the most famous in the peninsula, rises from two springs in a wood of beech trees in a dell of the Tuscan Apennines (province Arezzo), about six miles north of the village of Pieve-San-Stefana, and in lat. about 43° 45′ N. Its course until it reaches Perugia is south-south-east; thence, as far as Rome, it pursues, along an irregular zigzag line, a southern direction; but when it enters the plain of the Campagna, it curves to the south-south-west, and enters the Mediterranean by two branches, which enclose the Isola Sacra. The entire course of the river is about 212 miles. The most celebrated towns on or near its banks are Perugia, Todi, Orvieto, Rome, and Ostia; and its chief affluents are the Nera (anc. *Nar*), and Teverone or Aniene (anc. *Anio*) from the left, and the Chiana from the right. In the upper portion of its course, from its source to the city of Orvieto, it is rapid and turbid, and of difficult navigation. It is regularly navigable for boats of 50 tons to the confluence of the Nera, 100 miles from its mouth, and small steamers ascend to within 7 miles of that point. Wine, corn, charcoal, wood, and other produce from the interior are conveyed by the T. to Rome. Within the walls of Rome (q. v.), the width of the river is 300 feet, and the depth from 12 to 18 feet. Of its two mouths, the northern, the Fiumicino, is the channel of commerce; the southern, the Fiumara, is useless for commercial purposes, owing to the accumulation of sand at its mouth. The T. is supplied mostly by turbid mountain torrents, whence its liability to sudden overflowings of its banks; even the oldest Roman myth, that of Romulus, being inseparably associated with an inundation. Its waters, too, are still discoloured with yellow mud, as when Virgil described it—

Vorticibus rapidis et multa flavus arena.

TIBE'RIAS. See GALILEE.

TIBE'RIUS (TIBERIUS CLAUDIUS NERO CÆSAR), the second emperor of Rome, was the son of Tiberius Claudius Nero, one of the active partisans of Pompey and Antony in the war of the second triumvirate, and of Livia, a descendant of Appius Claudius Cæcus, and was born 16th November 42 B. C. The triumvir, Octavianus Cæsar (afterwards the Emperor Augustus) having become enamoured of Livia, the complaisant husband divorced her, and, though then pregnant with Drusus, she was immediately espoused by Octavianus (38 B. C.). T. being now one of the imperial household, received a careful education, was allowed by Augustus the same public honours as were paid to his nephew and grandsons, and as well as his brother Drusus, was employed in active service at the head of the legions on the outposts of the empire. T. was at this time in favour with the emperor and the Roman people, chiefly because his retired mode of life and subordinate position restrained his evil propensities; and his praises as a military leader were loudly sounded, though the character of his opponents was not such as called for the display of very great warlike ability. At the command of Augustus, he unwillingly divorced his wife, Vipsania Agrippina, to marry the emperor's daughter Julia (11 B.C.); but disgusted at her open profligacy, he gladly accepted a command on the

German frontier, and afterwards (6 B.C.) retired to Rhodes, where he lived for seven years, returning after Julia's banishment to Pandataria. The death of two of Augustus's three grandsons paved the way for the adoption of T., and of the third grandson, Agrippa Postumus, by the emperor, and for the appointment of T. as heir to the throne, Agrippa being, apart from his youth, wholly unfitted for the exercise of uncontrolled authority. Accordingly, T. ascended the throne (14 A.D.), and by his manly and graceful demeanour, prudence and moderation, gave promise of a happy reign. His mild and benignant sway at first, was doubtless due in part to the necessity of outbidding his popular nephew Germanicus (who was of Octavian blood by his mother's side) for public favour; but after his kinsman's death (19 A.D.), and the removal of all who were likely to put forth claims to the throne, T.'s true character became better known. He had always shewn himself reserved, jealous, timid, and irresolute, though not cowardly, and almost devoid of sympathy and affection; and with the sceptre firmly in his grasp, the development of these qualities produced the most suspicious and cruel of tyrants. During the life of his mother, however, T., who held her somewhat in dread, took little share in the government, but led a retired life, attempting to ape the virtues he had not. The chief events of this part of his reign were the increase in number and amount of the taxes, the removal of all power from the people and the senate, and the institution of prosecutions for *læsa majestas*, the latter being nothing else but a convenient mode of removing all who incurred the displeasure of the emperor. But after Livia's death (29 A.D.), he resigned the whole real authority into the hands of Ælius Sejanus, a Roman knight, and a commander of the prætorian guards, and gave himself up to the unrestrained indulgence of his sensual appetites. The empire did not suffer by the change, for Sejanus was a man of great ability and resolution, and well knew how to maintain his ascendency over the emperor by pouring into his suspicious ear tales of conspiracy, and then allaying the imperial fears, and satisfying his own private enmities by the condemnation for *læsa majestas* of eminent Roman citizens. In 27 A.D., T. retired to the island of Capri, there to wallow in his brutish enjoyments with more freedom, leaving Sejanus, whom he made his coadjutor in government, and equal in position, at the head of the government; and from this period till the discovery of the ambitious aspirations of Sejanus, and his downfall (31 A.D.), the Roman annals are crowded with proscriptions at Rome, and infamous excesses at Capri. Sejanus's successor, Macro, had all his vices, and few or none of his talents, and so the state of affairs was even worse than before, the senate exhibiting a rare degree of sycophancy, by endorsing with the most accommodating promptitude every order, however tyrannical, of the emperor or his confidant. It may seem strange that this frightful misgovernment by an aged debauchee and his ignoble favourite should have been so quietly submitted to by the Romans, but in reality their tyranny was confined exclusively to those of rank, the common people being treated with forbearance and occasional liberality, as there was nothing to fear from them. T.'s powerful constitution was at last completely destroyed by his excesses, and falling sick at Astura, he travelled to Misenum, where, in the villa of Lucullus, he ended his infamous life, 16th March 37 A.D., his death being hastened a few days either by poison or suffocation.

TIBE'T, THIBET, or TUBET, is the European name of a country in Central Asia, bounded on the N. by Mongolia, on the E. by China, on the S. by India, and on the W. by the N.-West provinces of Hindostan. The native name is Bod or Bodyul, the land of Bod. It covers an area of from 600,000 to 800,000 sq. miles, with the north-eastern part of which we are still very imperfectly acquainted. The pop. is estimated at 6,000,000.

Surface.—Although Tibet has been described by geographers as the loftiest inhabited table-land on the globe, its surface is traversed by mountain-chains. The average height of its western part is 12,000 feet, but it rises farther east to a level of 17,000 feet—the mean average elevation of the whole tract being not less than 15,000 feet—that of the top of Mont Blanc. From this enormous elevation, it looks down on the less elevated plateau of the Gobi Desert; and on the east, south, and west, it sinks to the low plains of China, India, and Turkestan. All round, it is fringed by mountains, which present on almost all sides abrupt slopes. From a mountain-knot at the western extremity of T., the great mountain-system of the Kuen-lun, which is the continuation of the Hindu Kush, runs east; and from the same point, the still greater chain of the Himalaya—the continuation of the Bolor Mountains—runs south-east. Between these mountain-walls (i.e., the Himalaya and the Kuen-lun) lies the Tibetan table-land, so called by geographers, although its surface is traversed by mountain-chains, which, at its western extremity, and as far east as the lake Manasarowar, interlace and ramify in a complicated manner. Although the Himalayas form the southern edge of the table-land, the greatest mountains of this range, 20 of which are higher than the loftiest of the Andes, stand out from the plateau, and are only connected with it by ridges of lesser elevation. They project from the high lands like buttresses which rise higher than the walls they support. In general, the descent from T. takes place by three gradations, the first of which is very abrupt. The mountain-roads by which T. is entered from India, pass through deep ravines cut by the streams in the mountains, and present the wildest and grandest scenes described by travellers.

The mountains which rise from the table-land divide T. into several natural regions. The Karakorum range, which runs parallel to the Himalaya, forms with them a great valley, drained on the west by the tributaries of the Indus, and on the east by the Sanpu. To the whole basin of the Indus, the name of Little Tibet is sometimes given; but more generally the upper basin is known as Ladak, or Middle Tibet; and the lower as Bultistan, or Lower Tibet. The countries drained by the Sanpu are described as Tibet Proper, which is in turn divided into Dsang, the district of the Upper Sanpu, and Wei, surrounding H'lassa, the district of the Lower Sanpu. Further east, the tract drained by the tributaries of the Yang-tze-kiang, in which are Lithang and Bathang, is known as Kham. North of the Karakorum range lies another region, a great elevated desert, called Khor on the west, and Katchi on the east; and at the north-eastern extremity of T. is a hilly tract, in which the Hoang-ho takes its rise, and in the centre of which is situated the Lake Ko-ko-nor. The provisional name given to the tract is the country of the Ko-ko-nor. The divisions of T., then, are—1. Bultistan; 2. Ladak; 3. Dsang; 4. Kham; 5. The desert of Khor and Katchi; 6. The hill-country of the Ko-ko-nor.

Geology.—The geology of T. is little known except on the south and western frontier. The highest part of the Himalaya consists of granites and crystalline strata, and in the neighbourhood of the Lake Manasarowar, of volcanic rocks. On the table-land, the strata belong to the most recent Tertiary epoch (the Pleistocene). They lie horizontally as they were deposited, and seem to have been lifted up in one unbroken cake to their present prodigious elevation.

They abound with the remains of the elephant and rhinoceros, from which it may be inferred that at a very recent period, one perhaps subsequent to that of man, the area now occupied by T. was a low land, with a tropical or semi-tropical climate. T. is believed to abound with silver, copper, and tin, but the absence of fuel renders its mineral wealth unavailable. Gold is found in considerable quantities; and salt, sulphur, borax, and nitre abound.

Climate.—T. lies between the latitudes of Naples and Cairo, and might be supposed to enjoy a similar climate. But its great elevation—greater, we have seen, than that of the highest of the Alps—renders it excessively cold during the winter, when its climate resembles that of the arctic regions, more than that of countries in the zone to which it belongs. The mountains and the great plains which lie between T. and the sea rob the winds of their moisture, and hence another peculiarity of the climate is its excessive dryness. Timber never rots, but it breaks from brittleness; flesh exposed to the wind does not become putrid, but dries, and can be reduced to a powder. The air loses its conducting power; and persons dressed in sheepskins give out long electric sparks when they approach conducting substances. During the winter, the winds are excessively high, and the weather-beaten rocks break into a dust, which mixes with the loose alluvial soil, and with it is blown about in blinding clouds. The limit of perpetual snow is from 16,000 to 18,000 feet high on the Tibetan side of the Himalaya, while on the Indian or southern side it is in some places only 13,000—a fact attributed to the dryness and purity of the air above the table-land. The Tibetan glaciers, particularly in the mountain region of the west, are of enormous extent. In a paper read to the Geographical Society (13th May 1866), Captain Montgomerie describes one of these, the Biafo Glacier, as 32 miles in length, or more than four times as long as the Mer de Glace. Further east, however, the mountains are less covered with snow, and no great glaciers have been described. Pastures and low bushes make their appearance at 18,544 feet—2800 feet higher than Mont Blanc, and 1279 feet above the snow-line on the Andes near Quito. Below this level, extends a country of bare and scanty pastures. Owing to the great dryness of the air, trees (the cedar and birch) are only met with in a few scattered spots on the hills. In the great plains, the pursuits of the inhabitants are chiefly those of the pastoral tribes of the steppes of Central Asia. In the valleys, however, the soil is more productive; and fruit-trees, the vine, and the European grains are cultivated. The conditions of the climate render irrigation necessary, and the construction and maintenance of terraces along the slopes. This has given rise to a kind of agriculture, characteristic of T., which demands skill and continuous labour, and which has called into existence an intelligent, strong, and hardy population. Among the productions of T. are barley, buckwheat, grapes, and all the European fruits. Wild animals are numerous in the Tibetan hill-countries, and among others met with may be enumerated the badger, the bear, the leopard, the lynx, the wild cat, and the tiger, wild oxen, the buffalo, the yak, and the musk-deer. All our domestic animals are known; and fish abound in the streams, but are prohibited as articles of food by the Buddhist religion.

Industry.—The Tibetans have made considerable progress in the industrial arts. They are ingenious jewellers, and manufacture extensively fabrics of wool and goats' hair, Buddhist idols, &c. In spite of the inaccessible nature of the country, and the absence of good roads and bridges, the rivers being crossed by inflated skins, a great trade is carried on with the neighbouring low lands. That with China is conducted chiefly at Sinning, but partly at H'lassa, by caravans, the goods being conveyed on the backs of oxen, mules, and horses. The raw produce of T. is exchanged for tea, or Chinese manufactures, and European cutlery. A great trade is also carried on with Nepaul and Bhotan, from which, in exchange for the produce of T., broadcloths and Indian manufactures are imported. From Turkestan the trade is no less important, the chief imports being horses and camels. The importance of the transit-trade of T., and the enterprise of the traders, may be judged of by the fact, that all the Chinese goods in Bhotan and Nepaul, where their use is general, are brought to these countries from T. over the passes of the Himalaya.

Language and Religion.—The language of the Tibetans, spoken also in Nepaul, and by the inhabitants of Bhotan, belongs to the monosyllabic or Chinese class. See PHILOLOGY. Tibetan is singularly free from dialects, from which it is concluded that it spread rapidly in recent times. It has a copious literature, chiefly religious. The religion of the Tibetans is a kind of Buddhism. See LAMAISM. At the extreme west, in Bultistan, however, Mohammedanism prevails, which, having spread from Cashmere and Persia, and not from Turkestan, is Shiite. Some practices common, it is believed, to the earlier races of men, are said to survive among the Tibetans. The most remarkable is Polyandry (q. v.), brothers being allowed to have one wife in common.

Government.—Almost the whole of T. is now tributary to China. The government is to some extent, however, in the hands of a Buddhist hierarchy, the name of the chief priest being the Dalai-lama, and the second the Bogdo-lama. These spiritual and temporal princes rule in different parts of the country. There are Chinese soldiers in all the chief towns, and a few years ago their number was said to be upwards of 60,000. The Chinese generals have the entire control of the army, and the direction of the most important temporal affairs. Commerce is in the hands of the government, and is closely watched, there being Chinese garrisons at the entrance to all the chief passes.

There are several important towns in Tibet, of which H'lassa (q. v.) is the chief.

History.—The early history of T. is legendary. The first king, who flourished 113 B.C., was exposed in a copper box, and afterwards found swimming in the Ganges. About the commencement of the Christian era, Sakya, the last great teacher of the Buddhists, is said to have settled at H'lassa, 'where he is supposed to be still alive in the person whom we call the Grand Lama.' In 821, T. was compelled to pay tribute to China. Early in the 10th c., King Dharma adopted Mohammedanism; but he was killed in 925, and Buddhism was re-established. In the beginning of the 11th c., T. was split into several states, and its power declined. In the 12th and 13th centuries, the Chinese began to conquer the eastern parts of T., which, however, did not become tributary to Pekin till 1720, when they were placed under their present government. Western Tibet has been more exposed to the inroads of the Turkish tribes than of the Chinese. The former were, however, expelled from it by Aurungzebe in the 17th c., and then it was that Mohammedanism was introduced. In the early part of this century, Western Tibet was annexed to the Sikh empire of Runjeet Singh. It now forms part of the territory under British supervision, known as 'Gholab Singh's dominion.'

Until a comparatively recent period, T. was only

known from the accounts given by Marco Polo and the Jesuit missionaries, travellers respectively of the 13th and 17th centuries. It was, however, visited in 1783 by Samuel Turner, who was sent by Warren Hastings on a mission to the Dalai-lama. It has since been partially explored by Moorcroft, Captain Strachey, the French Jesuits Huc and Gabet, the brothers Schlagintweit, to whose writings readers are referred for further information, and to Major Montgomerie's *Reports of Trans-Himalayan Explorations*, published in the *Journal of the Royal Geographical Society.* The latest information was received in 1873 from the Abbé Desgodins, a French missionary, who is making careful scientific observations.

TIBU'LLUS, ALBIUS, the Roman elegiac poet, was born of equestrian family, probably 54 B.C., and died young, not long after Virgil, about 18 B.C. We know nothing of his youth or education. From his equestrian ancestors he inherited an estate at Pedum, between Tibur and Præneste, which, like the estates of Virgil and Horace, had been either wholly or partially confiscated in the civil wars. T., however, recovered part of his property, and spent upon it the best part of his short life. He was patronised by Messala, whom, in 31, he accompanied into Aquitania, to suppress a serious revolt which had broken out in that province. He was present at the battle of Atax, which gave the final blow to the insurgents; and he celebrates, in a fine strain of poetry, the honourable part he bore in the campaign. Next year, Messala was sent to the East, and again T. accompanied him; but having been obliged from illness to stop at Corcyra, he returned to Rome. At this point, the public life of T. ceases; and henceforth he devoted himself to the study and composition of poetry. His Elegies, divided into four books, are mainly addressed to his mistresses, Delia, Nemesis, and Glycera, whose inconstancy or coldness he bewails in tender and exquisitely finished verses. The third book, however, is now believed to be the work, not of T., but of another and inferior poet; while the hexameter poem on Messala, with which the fourth book opens, is, from internal evidence, supposed to be also by another and inferior hand. Only the first book was published during the poet's lifetime, which, brief as it was, yet passed peacefully away amid all the blessings of pecuniary competence, patronage of the great, health, and fame. The character of T. was singularly pure, amiable, and winning. During life, he had the honour of being addressed in an ode and an epistle by Horace: after death, of being bewailed in an elegy of matchless beauty by Ovid. The best edition of his poems is that of Dissen (Göttingen, 1835).

TIC DOLOREUX. See NEURALGIA.

TICHVI'N, a town of Great Russia, in the government of Novgorod, 168 miles east-south-east of St Petersburg, on the Tichvinka, which, together with the canal of the same name, connects the Volga with the Baltic. It contains numerous churches, but is best known for its monastery, which contains a 'thaumaturgical' or miracle-working image of the Virgin. The inhabitants are chiefly employed in the transit-trade by land and water. Pop. 6387.

TICI'NO, the most southern canton of Switzerland, bounded on the W. and S. by Italy, and on the E. by Italy and the canton of Grisons. Area, 1082 sq. m.; pop. (1880) 130,777. Its surface, forming a portion of the southern slope of the Alps, comprises lofty mountains in the north. The northern boundary between T. and the cantons of Uri and Grisons is a range of the Lepontine Alps, rising in Mount St Gothard (q. v.) to the height of about 12,000 feet. Offsets from the Lepontine and Rhætian Alps occupy the greater part of the canton. In the south, the country falls away into flats, and the scenery becomes Italian in character. The principal rivers are the Ticino (q. v.), by which the whole of the canton, with the exception of a trifling portion, is drained, and from which it receives its name. In the north, cattle-breeding and the preparation of dairy produce are the chief employments. South of the Alpine regions are elevated forest-clad districts; and further south, oliveyards and vineyards, corn-fields and plantations of figs, almonds, oranges, citrons, and pomegranates occur. The canton varies as much in climate as in productions. Cattle, cheese, wine, fruits, and hay are exported. The northern part of Lake Maggiore, and almost the whole of Lake Lugano, are included within the canton. The inhabitants belong to the Italian type, and for the most part speak the Italian language, and are of the Catholic religion. The chief towns are Bellinzona, Locarno, and Lugano, each of which is by turns the seat of government.

TICINO, a river of Switzerland and the north of Italy, rises on the southern slopes of Mount St Gothard, and flows south through Lake Maggiore, and south-south-east through the north of Italy to its junction with the Po, four miles below Pavia. Entire length about 120 miles, for the last 75 of which, from the point at which it leaves Lake Maggiore, it is navigable.

TICK, the popular name of a great number of *Acarides* (see ACARUS), forming a section called *Suctoria*, having the mouth in the form of a sucker, with no apparent mandibles. They live by sucking the juices of plants and animals. Some of them are aquatic. The Harvest-bug (q. v.) is a well-known example of the suctorial *Acarides.* It belongs to a family called *Leptidæ.* The name T. is more particularly given to the family *Ixodidæ.* They abound in almost all parts of the world, but chiefly in warm countries, in which they are very troublesome pests. Many of them live in woods, attached to branches, but are ready to attach themselves to animals, which sometimes suffer greatly from their numbers, their blood-sucking powers, and the inflammation which they cause. The Tampan (q. v.) is a very troublesome T. of South Africa. The Carapata of Brazil is scarcely less

Harvest Bug
(*Leptus autumnalis*).

Dog Tick
(*Ixodes plumbeus*).

annoying. It infests dry bushy places, clusters of many hundreds being found clinging to very slender twigs, and they instantly transfer themselves to any horse, ox, or other quadruped which comes in contact with them, burying their serrated suckers in its skin, so that they cannot be withdrawn without considerable force. If not taken off, they go on increasing in size, till they become as large as a horse-bean, or even larger. Whole herds of cattle sometimes perish from the exhaustion which they cause. Wet weather, however, soon kills them, and an animal made to swim across a river, is almost freed from them at once. Travellers in

the interior of Brazil are sometimes obliged to pick hundreds off their own bodies before retiring to rest for the night.—The DOG T. (*Ixodes plumbeus*) is common in Britain, abounding on ferns in fir plantations, &c., in many places in autumn, and attaching itself to dogs, oxen, and other animals, sometimes even to man. It is in form and size like a grain of linseed, oval, shining, reddish, with a pale margin. The body swells to the size of a small horse-bean after the T. has attached itself to an animal, and the wound is attended with much inflammation and pain. Tortoises have ticks peculiar to them, which adhere to their neck, and by the thickness of their leathery coat, are preserved from being crushed when the head is retracted within the carapace.

TICKET OF LEAVE is a term which is properly applied only in regard to convicts in the Australian colonies. A kind of permit was given to them after a certain period of their sentences, if they could be trusted at large. It required the convict who held it to remain within a particular district. The term was afterwards popularly applied to the kind of document, called technically an 'order of licence,' which sets a convict at large in the British Empire before the expiry of his sentence. The occasion of its being first used was when, after the year 1840, the colonies, one after another, refused to receive convicts. If those sentenced to transportation were kept in prison in this country for the whole period of sentence, its severity would be greatly increased; and hence, by way of compensation to the convicts not taken abroad, part of their sentence was remitted. On the form of the sentence being recently changed from transportation to penal servitude, the partial remission was made systematic, as an inducement to good conduct and industry. Under the existing act of 1864, the period of remission which may thus be gained is for males about a fourth, and for females about a third, of the whole sentence. The method of adjusting the period is by debiting the convict with so many marks, representing the amount of industry that must be accomplished to gain the largest period of remission; and according to the proportion of these gained will the amount of remission or order of licence or ticket of leave be. See CONVICT, PRISON DISCIPLINE.

TICKING, a strong cloth, used chiefly for making beds, mattresses, and paillasses. Formerly, it was always manufactured of linen, but cotton is now largely used for this purpose. A very general character of ticking is that it is woven in stripes of two colours, blue and white.

TICKNOR, GEORGE, an American scholar and author, born in Boston, August 1, 1791, educated at Dartmouth College, admitted to the bar in 1813, but devoted himself to literature. From 1815, he spent five years in Europe, residing at Göttingen, Rome, Madrid, Paris, Edinburgh, and London, where he made the acquaintance of the most distinguished men of letters. Returning to America, he became Professor of French and Spanish Languages and Literature in Harvard University. In 1835, resigning his professorship, he went with his family to Europe, where he remained three years, collecting materials for his *History of Spanish Literature* (New York, 1849, 3 vols. 8vo; 3d ed., 1863), an exhaustive and admirable work, which has been translated into Spanish and German. Mr T. also edited *The Remains of Nathaniel Appleton Haven*, and wrote a *Life of Lafayette*, first published in 1825 in the *North American Review*. His last work (1864) was the biography of his friend W. H. Prescott. Mr T. died in 1871.

TICONDERO'GA, a small township in New York, U. S., on Lake Champlain, enclosing the outlet of Lake George, 95 miles north-by-east of Albany; and the name also of a lofty promontory in the township, of which the extremity, Mount Defiance, rises 750 feet above the lake. The falls of the outlet of Lake George, 150 feet in 1½ miles, afford constant water-power for timber-mills; and a vein of graphite supplies 30 tons of fine black-lead a year. The promontory was fortified by the French in 1755. In 1757, Montcalm assembled here a force of 9000 men, with which he took the English fort, William Henry, on Lake George. In 1758, General Abercrombie, with 15,000 men, attempted to storm the French fort, then called Carrillon, but was repulsed, with a loss of 2000. In 1759, it was invested by General Amherst, and the French dismantled and abandoned both this fort and Crown Point, which were then enlarged and strengthened by the English at a cost of £2,000,000. Being weakly garrisoned after the cession of Canada to Great Britain, it was, in 1775, surprised and captured by Ethan Allen. In 1777, it was recaptured by General Burgoyne, by erecting a battery on an unprotected height which commanded it; but after the surrender of Burgoyne, it was dismantled and abandoned. It was again occupied by the British troops in 1780, and at the close of the war, became a picturesque ruin.

TIDE-MILL. See WATER-POWER.

TIDES. It was known, at least as early as the time of Cæsar, though probably long before, that the time of high-water, and also the height of the tide, are in some way connected with the age of the moon. And even in the present state of science, what is called the *establishment* of a port, or the time of high-water at new or full moon (that is, the interval between the moon's crossing the meridian and the full tide), which is practically the most important part of the whole question, cannot be predicted by theory, but must be obtained by observation. The first attempt to explain the phenomena of the tides was made by Newton; and, considering the little that has, since his time, been effected, his approximate solution must be pronounced highly creditable, although in many respects unsatisfactory. D. Bernouilli and others have since slightly improved Newton's method; and a complete solution of the problem has been attempted by Laplace. The principles involved in this solution are undoubtedly correct, and the result, so far as it goes, leaves little to be desired. But it does not go far, for two reasons: we know very little as to the depth of the sea; and, even had we that knowledge, the excessive difficulties of the mathematical processes required in taking account of it, and of the forms of continents and islands, would be such as to render Laplace's method inapplicable.

Newton's approximate method consists in the study of the problem as a *statical* one, and this we will presently describe. Laplace, on the other hand, treats the problem as one of fluid *motion*. Airy and others have, more recently, attempted, with success, to simplify Laplace's process. Curiously enough, however, the results of all these theories are very much alike; and, while some of the results agree well with observation, others seem irreconcilable with it. We cannot explain Laplace's method without employing high analysis, quite unsuited to this work; so we must be content to describe the faulty theory. In the Newtonian or *Equilibrium* Theory, we consider the earth to be spherical, and covered with a layer of water, which would, of course, if left to itself, be uniformly deep over the whole surface. The

attraction of the moon (per unit of mass) on the water immediately below her, is greater than her attraction on the solid earth (per unit of mass), and tends, therefore, to raise the water at that part of the surface. At the point of the surface directly opposite to the moon, the water-layer is further from the moon than the bulk of the earth, and, consequently, the moon attracts the water (per unit of mass) *less* than it attracts the earth. The tendency is, as it were, to pull the earth away from the water, so that here also the water is raised, though not *quite* so much as on the other side, as the moon's attraction diminishes with distance. The effect of the moon's action on the previously uniform layer of water, is thus to elongate it both ways in the direction of the line joining the centres of the earth and moon. On account of the very small amount of this elongation, it is found by mathematical processes, which we cannot give here, that the form of the surface will become very nearly a prolate spheroid (a solid formed by the revolution of an ellipse about its *longer* axis).

[Before proceeding further with our explanation, it is necessary to say a few words with reference to a mistake often fallen into by those whose knowledge of mechanics is scanty; and at times paraded with a show of learning by a class of men who doubt such plain matters of fact as the moon's rotation, the oblateness of the earth, the inertia of matter, and what not. Such people say that, since, if the moon and earth were rigidly fixed to each other, the water would rise only on the side next the moon, this must be the case in nature also. This is the same mistake as those commit (see PERTURBATIONS) who allow that at new moon the sun virtually diminishes the moon's gravitation towards the earth, but refuse to allow that the same is true at full moon.]

We have next to consider that the moon revolves about the earth, and that the earth also revolves about its axis. Thus, the equilibrium figure has never time to form; but an imperfect form of it travels round the earth in the time of a lunar day (24 hours 54 minutes). If the moon be on the equator, it is obvious that similar portions of the water-spheroid will reach any one spot on the earth at intervals of half a lunar day (12 hours 27 minutes). If the moon's declination be considerable, such will not be the case—a place, for instance, whose latitude is equal to the moon's declination, will be reached by one pole of the wave-spheroid when the moon is on the meridian; but in 12 hours 27 minutes, the other pole of the spheroid will not pass over the place, but at a meridian distance of twice the latitude of the place, or twice the moon's declination. Thus, when the moon's declination is sensible, the two tides of each day are not generally equal in height, except for places on the earth's equator. This gives rise to what is called the *diurnal* tide, which is, as it were, superposed upon the ordinary, or *semidiurnal*, tide, and ought to be more sensible as the latitude is greater. Owing to fluid friction, and other causes, we should expect that the axis of the tidal spheroid would lag a little behind the moon, and this is found to be the case.

So far, we have a general explanation of the occurrence of tides twice a day, and of their dependence on the moon. But we started with two assumptions which are not consistent with fact, viz., that the earth is spherical and uniformly covered with water, and that the moon is the only tide-producing body. The corrections to be made in consequence of the inaccuracy of these assumptions, must now be explained. We commence with the latter. The sun, although at an immense distance compared with that of the moon, has such an enormous mass, that his tide-producing influence is comparable with that of the moon. In fact, it is easy to see that, as Newton shewed, the tide-producing power of an attracting mass is directly as the mass, and inversely as the *cube* of its distance. That it is directly as the mass, is obvious. To prove the other assertion, let R be the earth's radius, D the distance of the attracting body from the earth's centre, then the attraction per unit of mass on the earth is to that per unit of mass on the water nearest the attracting body as

$$\frac{1}{D^2} \text{ to } \frac{1}{(D-R)^2},$$

according to the law of gravitation. The difference between these quantities is proportional to the tide-producing force. But

$$\frac{1}{(D-R)^2} = \frac{1}{D^2\left(1-\frac{R}{D}\right)^2} = \frac{1}{D^2}\left(1+\frac{2R}{D}+\&c.\right)$$

$= \frac{1}{D^2} + \frac{2R}{D^3} +$, &c., the remaining terms being omitted, since D is always much greater than R. The difference is therefore approximately

$$\frac{2R}{D^3},$$

as stated above.

Now the mass of the sun is to that of the moon as 355,000 to 0·0125, and the sun's distance is about 400 times that of the moon. Hence the tide-producing power of the sun is to that of the moon as

$$355{,}000 \text{ to } \cdot 0125 \times 400^3$$
$$\text{or } 355 \text{ to } 800.$$

By calculations, which we cannot give here, it has been shewn that the difference of length of the axes of the wave-spheroid produced by the moon alone is about 58 inches; so that in that due to the sun it will be about 25·7 inches.

In consequence of the extremely small amount of these effects on the sea-level, we are entitled to simply add or superpose the separate effects of the sun and moon, in order to obtain their joint effect. And now we have at once the explanation of what are called *spring* and *neap* tides. At new and at full moon, the wave-spheroids due to the sun and moon have their axes almost coincident, so that we have a tide which is to the lunar alone as 800 + 355 to 800, or as 13 to 9 nearly; while, when the moon is in her first or last quarter, the axes are nearly at right angles, and the compound tide is to the lunar tide alone as 800 — 355 to 800, or as 5 to 9 nearly. Thus, the height of the spring-tide is to that of the neap-tide in the ratio of about 13 : 5.

Another curious phenomenon, which we can now easily account for, is the 'priming' and 'lagging' of the tides, or the *acceleration* and *retardation* of the time of high-water. If the tides were due to the sun or moon alone, they would recur at equal intervals of time; and, in fact, this is the case with the lunar and solar tides separately. But what we observe is the compound tide, and this will obviously have its maximum *between* two consecutive maxima of the lunar and solar tides; but nearer to the lunar tide, as it is the greater. Thus, if about new moon the sun passes the meridian *before* the moon, the tide is accelerated; if *after*, it is retarded. And the same is true about full moon, only that in this case our statement refers to passages of the sun and moon on opposite sides of the meridian. This retardation or acceleration has for its greatest value a period of rather less than an hour; and the respective maxima occur about 4½ days before and after the spring-tides.

But we meet with far more serious difficulties when we come to consider the actual distribution of water over the earth's surface; and it is here that future improvements must be looked for.

But even so inadequate an attempt at a solution as is the equilibrium theory, gives us the means of explaining a great many curious observed phenomena. It shews, for instance, how exceedingly small we should expect to find the tides in an inland sea, such as the Mediterranean; for there, even when the moon is most favourably situated, the utmost difference of level would be (by calculations which we cannot give here) only about an inch or two; and of this, part would be the rise in one portion of the sea, the rest the fall in others. The popular explanation of this phenomenon is very simple. We have but to notice that, according to the equilibrium theory, the form of the water is a spheroid of definite dimensions, its axes differing from each other by 58 inches. But a small portion of such a spheroid (of the dimensions of the Mediterranean, for instance) can hardly be distinguished from a sphere; so that the form of the surface of a limited mass of water will be but slightly altered by the attractions of the sun and moon.

It is obvious from what we have just said, that the rise of the water in tidal rivers, estuaries, and deep bays, where it sometimes amounts (even in calm weather) to more than 100 feet, cannot possibly be due to the moon's action upon the water of the mere river or bay, but must be almost entirely produced by the tidal wave in the ocean; and, in fact, this part of the problem presents comparatively little difficulty. Once grant the fact of the tidal disturbance of sea-level at the mouth of a river, and the calculation of the motion of the consequent wave in the river-channel is within the power of mathematics. It is by means of investigations made from this point of view, and by others concerning the effect of the moon on long canals, that Laplace's method has been improved. For the details of the process, see Airy on 'Tides and Waves,' in the *Encyc. Metrop.* All we can do here is to point out a few of the immediate consequences of the periodic rise and fall of the sea-level as regards the motion of the water of a tidal river. Here the tide always runs *up* the river, even when, as in the case of the Severn, this is the opposite direction to that in which the moon appears to move. In the open sea at the mouth of the river, the interval from high to low water is almost exactly equal to that from low to high water, each being about 6¼ hours nearly. But the further we go up the river, the greater becomes the disparity between these periods, high-water following low-water at shorter and shorter intervals, while the intervals during which the tide falls are correspondingly increased. In some cases, as at certain points in the Seine and Severn, the interval from low to high water is so short that the tide-wave rushes suddenly up, and, spreading over the flat sands at the side of the channel, forms a dangerous surf called a *Bore* (q. v.).

Connected with these peculiarities, there is also a singular effect produced on the direction of the current in a tidal river. In the open ocean, the water merely rises and falls, there being no perceptible tidal current. Sailors are in the habit of associating the cessation of currents, or 'slack' water, with the occurrence of high and low water. This is the case in bays, but not in rivers, and it gives rise to some curious errors regarding the time of high-water in rivers. Thus it is sometimes said that it is high-water in the centre of the Thames' channel long after it is high-water at the shore—an obvious absurdity. The truth is, the current does not cease simultaneously at the shore and in mid-channel. At the mouth of a tidal river, the water runs upwards for hours after high-water, and downwards after low; and the same is true, in a less degree, at places higher up the stream.

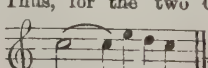
When considerable alterations of breadth or depth occur in the channel of a river, we find corresponding alterations in the amount of rise of the tide. Thus, according to Airy, at the entrance of the Bristol Channel, the whole rise at spring-tides is about 18 feet; at Swansea, 30 feet; and at Chepstow, 50 feet. At Annapolis, in the Bay of Fundy, the tide is said to rise 120 feet. Again, the same port may be reached by two tide-waves coming from the ocean by different channels; and here we have to compound the two disturbances just as we did with the separate lunar and solar tides. In the German Ocean, we have a very good example; but the most remarkable is the tide at Batsham, in Tonquin. At this port, two tide-waves meet, coming respectively from the Indian and China seas; these bring, simultaneously, opposite but nearly equal changes in the water level, and the effect is, that there is almost no perceptible tide.

Whewell, Lubbock, and others have lately added much to our knowledge of the *facts* of the tides; and have constructed what are believed to be tolerably accurate charts of *Cotidal Lines*—that is, lines representing the positions of the crest of the tide-wave at hourly intervals as it sweeps round the earth. A great deal, however, remains to be done in this direction, before we can hope to elicit from observation such hints as may enable us to improve the mathematical theory of the subject.

The frictional resistance to the motion of the tide-wave of course produces heat. This heat is a transformation of part of the earth's energy (see FORCE) of rotation; and thus it appears that the tides are gradually lengthening the day. We may see easily that this would go on, were the moon the only tide-producing body, so long as the earth rotates about her axis in less time than a lunar month. For, if the length of the (sidereal) day were that of a lunar month, the earth would always turn the same face to the moon; and the tide-spheroid would have a *fixed* position on the earth, and there would be no loss of energy by friction. Simple as this deduction is, though it seems to have been roughly guessed at by Kant, it was not formally enunciated till about a quarter of a century ago. Mayer was the first to publish anything on the subject, but it seems to have been previously noticed by others. One of the most curious deductions from it is the recent speculation which assigns, as the cause of the moon's turning always the same face to the earth, the friction of the enormous tides which must have been produced by the earth in her mass when it was in a molten state, on the surface at least, if not throughout.

The only work with which we are acquainted from which complete information as to our present knowledge of the subject of Tides may be obtained is that of Airy, in the *Encyclopædia Metropolitana*, already referred to.

TIE, in Music, an arch drawn over two notes on the same degree, uniting them so that they are played or sung as one single note of the same value. Thus, for the two C's written in the example



one is played of the value of a minim and quaver combined. The tie is often used in syncopated passages to connect the last note of one measure with the first of the succeeding

one, when the former note, which would otherwise be unaccented, acquires the emphasis of the latter:

See SYNCOPATION.

TIE-BEAM. See ROOF.

TIECK, LUDWIG, a brilliant and prolific German novelist and poet, was born at Berlin 31st May 1773, and studied at the universities of Halle, Göttingen, and Erlangen. He made his first appearance as an author in the *Straussfeder* (Ostrich-feather) Magazine, conducted by Musäus (q. v.) and J. G. Müller, for which he wrote a series of little tales, of which the best was *Die beiden merkwürdigsten Tage aus Siegmann's Leben* (The Two most Remarkable Days in Siegmann's Life). But the originality of his genius first displayed itself in his romances of *Abdallah* (Berl. 1795) and *William Lovell* (3 vols., Berl. 1795). These were followed by his *Peter Lebrecht, eine Geschichte ohne Abenteuerlichkeiten* (Peter Lebrecht, a History without Adventures, 2 vols., Berl. 1795—1796), and *Peter Lebrecht's Volksmärchen* (3 vols., Berl. 1797), which were equally remarkable for richness of fancy, artless simplicity, and an overflowing humour. In some of these *Märchen*, as, for example, his 'Bluebeard,' 'Puss-in-Boots' (*Der gestiefelte Kater*), and 'The Life and Death of Little Red Riding-hood' (*Leben und Tod des kleinen Röthkappchen*), he combated with satiric humour, perhaps, too, with somewhat of youthful arrogance, the 'enlightened' notions on which the literature of the 18th c. prided itself—shewing very distinctly his strong tendencies towards the deeper poetic spirit of the middle ages. The same polemic was maintained in his comedy, *Die verkehrte Welt* (The Topsy-turvy World, 1799). To this period also belong his *Herzensergiessungen eines kunstliebenden Klosterbruders* (Heart-effusions of an art-loving Monk, Berl. 1799), *Franz Sternbald's Wanderungen*, an art-novel (2 vols., Berl. 1798), and *Phantasien über die Kunst* (Fancies on Art, Hamb. 1799), all of which are full of a noble enthusiasm for art, but pervaded at the same time by a dreamy mystical religiosity, which is no longer admirable. These works brought T. into close relationship with A. W. von Schlegel and others, and led to the establishment of the literary sect or coterie known as the 'Romantic School,' whose influence on the later literature of Germany and France has been very great and not always very good. T. now married the daughter of a Hamburg clergyman who had been a friend of Lessing; and in 1799 went to Jena, where he added Steffens to the list of his friends. Here he published his famous *Romantische Dichtungen* (2 vols., 1799—1800). His translation of *Don Quixote* (4 vols., Berl. 1799—1801, 3d ed. 1831) far surpassed all previous attempts. In 1802, he joined A. W. von Schlegel in the *Musen-Almanach;* and in 1804 published his longest romance, *Kaiser Octavianus*. T.'s health now began to fail him, and in 1805 he visited Italy. On his return to Germany, he settled, after some changes, at Ziebingen in 1811, where he formed a friendship with the philosopher Solger, who exercised a great influence over his mind. Henceforth, we find less of the dreamy and formless mysticism of his earlier years, and more of the artistic element. The change becomes visible in his *Phantasus* (3 vols., Berl. 1812—1815), and in his *Ulrich's von Lichtenstein Frauendienst* (Tüb. 1815). In 1817, along with a friend, Burgsdorf, he paid a visit to England, where he collected fresh materials for his Shakspeare. From 1819 to 1840, he resided at Dresden; but on the accession to the throne of Friedrich Wilhelm IV. of Prussia, he was invited to Berlin, whither he proceeded, and where he resided for the rest of his life. His death occurred 28th April 1853. Other important works of T.'s, besides those already mentioned, are his *Novellenkranz* (Berl. 1831—1835; complete in 12 vols., Berl. 1853); in which there is hardly a trace of the credulous Romanticism of his earlier years, but abundance of lively and subtle talk on the literature and life of the Present; *Dramaturgische Blätter* (2 vols., Bresl. 1826), republished in his *Kritische Schriften* (4 vols., Leip. 1848—1852); *Shakspeare's Vorschule* (2 vols., Leip. 1823—1829); and his splendid continuation of Schlegel's translation of our great poet. T. revised a collected but incomplete edition of his works in 20 vols. (Berl. 1828—1842).—See Köpke's *Life of Tieck* (2 vols.).

TIEL, the seat of an arrondissement in the Netherlands, province of Gelderland, is picturesquely situated on the right bank of the Waal. In the 5th c., it was called Tellum or Thiela. The fortifications have been demolished, and formed into beautiful walks. Pop. 7748. Principal buildings are the Town-house, Court-house, Chamber of Trade, and the great Reformed Church of St Martin.

T. has a good haven, and large trade in agricultural produce and cattle. In 1864, 319 ships discharged grain, earthenware, wood, lime, coal, bricks, salt, &c.; taking in potatoes, grain, colza, pigs, flax, apples, cherries, &c. Principal industries are copper-founding, brick-making, tanning, book-printing, paper-making, beer-brewing, &c.

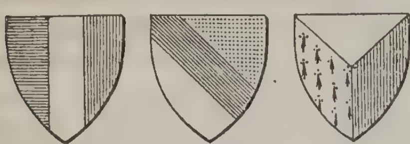
TIEN-TE (celestial virtue), the name given to the *Tae-ping-wang* (king of universal peace), the pretender to imperial authority in China, and the head of the mighty insurrection which for 16 years convulsed that country. See CHINESE EMPIRE and TAE-PINGS. The insurrection was under the direction of five chiefs, Hung-sew-tseuen, Hiang-tsew-tsing, Siao-tsha-kuei, Fung-hien-san, and Wei-tsing, independent of each other, but all acknowledging the supremacy of T.; and as, according to the plan of the rebellion, China, after being delivered from its Mantchu rulers, was to be divided among those chiefs, each of them assumed beforehand the title and insignia of 'king.' So little reliable were the statements which were forwarded to Europe respecting this insurrection, that for some time Hung-sew-tseuen, the chief among the five kings, and the military leader of the rebels, was confounded with their supreme head.

TIEN-TSIN, a large and important city and river-port of China, in the province of Chih-le, on the right bank of the Pei-ho, 34 miles from the mouth of that river by land, and 68 miles by the windings of the stream. It is the port of the city of Pekin, from which it is distant 80 miles south-east. The streets are unpaved, and the houses, principally built of mud or dried bricks, have a mean appearance, though the central parts of the town are filled with well-built houses. The maximum of heat in the summer is 106°, the maximum of cold is 6° below zero. The river is generally frozen over from about the 15th December to the 15th March, and the business at other times carried on by means of boats and junks, is taken up by sledges, which swarm on the river. By the Treaty of T., signed here November 1858, and by the subsequent Convention of Pekin, October 1860, the port was declared open; and a British consulate was established in January, 1861. In 1870, 258 vessels, of 100,223 tons, were engaged in the trade of T.; in 1871, the number of vessels was 316, of 124,517 tons. In 1867, the value of the imports was £4,500,000; that of the exports, £408,000; in 1868, the imports

amounted to £5,480,000; the exports to £314,920. In 1862, 9866 lbs. of cotton were exported. In 1864, 8,970,958 lbs. In 1871, the imports amounted to only £3,802,160; the exports to £630,441. The principal articles imported are gray and white shirtings, chintzes, and other cotton goods; needles, window-glass, sugar (brown and white), and paper; the chief exports are cotton, peas, and dates. Pop. reckoned at 1,000,000.—*Reports of Her Majesty's Secretaries of Embassy and Legation* (1862); and *Commercial Reports from Her Majesty's Consuls* (1866).

TIERCE. See FENCING.

TIERCE, TIERCÉ, in Heraldry, a term of blazon used to indicate that the field is divided by lines into three equal parts. A shield may be tiercé in pale, in fess, in bend, in bend sinister, or in pall; all which, with other arrangements in tierce, are common in French heraldry. Tierce in pale, in



IN PALE IN BEND IN PALL

English heraldry, is an occasional mode of marshalling three coats in one escutcheon under special circumstances.

TIE'RRA DEL FUE'GO (Land of Fire), an archipelago situated at the extreme south of South America, from the mainland of which it is separated by Magellan's Strait, consists of 11 large islands, of which the chief is King Charles's South Land, and about 20 islets; lat. 52°—56° S., long. 65°—75° W. The area of King Charles's South Land, which forms more than three-fourths of the entire area, is about 21,260 sq. m. This island, like the other islands of the archipelago and the coast of the mainland, is much broken on the west side by gulfs and inlets. The eastern coasts are, as a rule, level and wooded; while the western coasts are generally rocky and mountainous. The general aspect of the group is wild and desolate in the extreme. Some localities, however, are of quite a different character. The coast-scenery of Picton Island resembles that of the south-west coast of England. The south part of the island is chiefly in moor and down; the north part is covered with thick forests. The scenery is fine, and there are fine freshwater lakes, frequented by abundance of waterfowl. Many of the mountains are volcanic—from which circumstance this region has derived its name —and lava and volcanic productions are seen everywhere. The highest mountains rise to from 6000 to 7000 feet, and are covered with snow. The climate is raw and cold, violent rains and snowstorms occurring in every season of the year. In this region, the waters of the Atlantic and Pacific meet and struggle together, and terrific tempests are frequent. The flora of the region comprises some plants found in Great Britain. Wild celery and spoonwort are the only edible plants; but by far the most important articles of food are shell-fish, which abound on the coasts, and a globular fungus, which grows in clusters round the trunk of the antarctic beech—an elegant evergreen, and the prevailing tree in the archipelago. The inhabitants, the number of whom is estimated at 2000, are generally described as a short, ugly, beardless race with long black hair, of a rusty iron colour, and occupying the lowest rank in the scale of civilisation. Captain W. Parker Snow, who visited T. del F. in 1855, reports somewhat differently of the inhabitants. According to him, the natives are robust-looking, powerful, and of the middle height, being on an average over 5 feet 3 inches in height. The only quadruped among them is the dog. When driven to extremities, they first eat their dogs, and then kill and eat the old women of their tribe. More than one attempt has been made to convert these savages to Christianity, but hitherto such attempts have proved abortive. In 1850, a mission-party of seven men, under Captain Allen Gardiner, the projector of the expedition, arrived at Tierra del Fuego. The missionaries were not well received by the natives, and the narrative of their residence on these coasts is simply a record of miserable disasters. Owing to the grossest mismanagement on the part of the home authorities, the wants of the mission-party were neglected, and they found themselves in a short time destitute of provisions. The relief that had been promised never came; and in the autumn of 1851, the whole party, after undergoing horrible sufferings, died of starvation. In the autumn of 1854, another missionary expedition set sail from Bristol for T. del F., under command of Captain W. Parker Snow; but after many endeavours, the attempt to form a mission-station on T. del F. was abandoned.

TIERS ÉTAT (Fr. third estate), the third branch of the French estates, which consisted of representatives of the trading inhabitants of the towns, and of the peasantry in the country. The *tiers état* played an important part in the opening scene of the Revolution. On the two other estates of nobles and clergy refusing to join them and deliberate in a common chamber, they, on June 17, 1789, assumed the title of *Assemblée Nationale*, and the sole right to legislate for France. The French *tiers état* differed completely in its origin from the third estate or Commons of England. The latter originated in the permission granted to the minor barons, instead of personally attending the national council, to appear by representatives; and with the representatives of the minor barons were joined in one house the representatives of the municipalities, which, as corporations, came to be considered in the light of tenants *in capite* of the crown. The designation 'Commons,' and the absence of title, have often misled foreigners to suppose that the men who gained their liberties and constitution for the English people were the *roturiers* or *bourgeois*; whereas they mostly belonged to the class which would, in continental phraseology, be called the nobility of the country.

TIETJENS, or TITIENS, TERESA, one of the first living operatic singers. She was born at Hamburg, of Hungarian parents, in 1834, and made her *début* in that city in the character of Lucrezia Borgia in 1849, taking at once a very high position on the lyric stage; and at Frankfurt and Vienna she was even more warmly received. Her first appearance in London, in 1858, was quite a triumph; and her later career has quite justified all the expectations formed of her. Her voice is a soprano of great volume and purity, which the wear of six operas in the week seems powerless to injure. Few, if any, singers of German training have ever been so thoroughly at home in the richly-embellished Italian style. [Died Oct. 3, 1877.]

TIFFANY, a kind of very thin silk gauze.

TI'FLIS, a government of Russia, in the Caucasus, bounded on the N. by the Caucasus Mountains, and on the S. by Persia and the Turkish dominions beyond Mt. Ararat. Area, 18,296 sq. m.; pop. (1871) 499,261, chiefly Georgians, Armenians, and Tartars. It is traversed in several directions by chains of

mountains, which belong either to the Caucasian Mountains (the peak of Kazbeck, 17,500 feet high), and extend over the north and east parts of the government, or to the Ararat, Achaltzick, and Alagiz Mountains, spreading from the sources of the Kur and Arax over the south districts. The principal lake, that of Goktcha, is about 50 miles long, and nearly 20 miles in extreme breadth. The rivers, the chief of which are the Kur and Arax, rise amid mountains, are very rapid, are confined between high banks, and are not navigable. The climate varies with the varieties of elevation of the surface; the soil, very fertile in some tracts, is not in general cultivated. Grain, tobacco, cotton, indigo, vegetables, and grapes are produced abundantly. T. is rich in mineral springs and in timber, the principal trees being the oak, elm, chestnut, and maple. The Christian and Mohammedan are the predominant creeds.

TIFLIS, an important Russian city, capital of the government of the same name and of the territory of the Caucasus (and south of the mountain range of that name), stands on both banks of the Kur, 165 miles—direct line—east-south-east of the Black Sea. There are several manufactories, in which woollen and linen cloths, carpets, and arms are made. T. was formerly a fortress, and the capital of the district of Georgia. It carries on an active trade with Persia, and is the great emporium of the Russian territory south of the Caucasus. In the vicinity are naphtha springs as well as thermal springs, which are much visited. T. was founded in the 4th c., and annexed to Russia in 1802. Pop. 71,000, mostly Arminians.

TIGER (*Felis tigris*), one of the largest of the *Felidæ*, equal perhaps to the lion in size and strength, and superior in activity. It has no trace of mane.

Head of Bengal Tiger.

It is more slender than the lion, its whole form more cat-like, its head smaller and rounder. All its motions are performed with the utmost grace and apparent ease. It does not climb trees, but winds its way through brushwood or jungle with great dexterity, runs very swiftly, and can leap 15 or 20 feet. It takes its prey either by running, or, more frequently, by lying in ambush and leaping upon it. Its strength is such that it is capable of carrying off an ox or buffalo. It is sometimes 15 feet in entire length to the tip of the tail; an instance is on record of 18 feet; the height is from 3 to 4 feet. The tigers of some regions differ considerably in size from those of others; thus the T. of Bengal is much larger than that of Bokhara. The hair is thick, fine, and shining; in the colder countries which the T. inhabits, it is thicker and longer than in tropical regions. The colour is a bright tawny yellow, beautifully marked with dark transverse bands, passing into pure white on the under parts; the dark bands are continued as rings on the tail. The tail is long, slightly tapering, clothed with hair similar to that of the body. Individuals sometimes occur, of a pale whitish colour, obscurely striped, the stripes only visible in particular lights. The T. is found only in Asia. It abounds in Hindustan, in the Eastern Peninsula, in Java, Sumatra, and other tropical islands. It is found also in China and Japan, and in Persia. Its range, however, does not extend much to the west of a line drawn from the mouth

Bengal Tiger (*Felis tigris*).

of the Indus to the Caspian Sea. It is found as far north as the south of Siberia, and even on the banks of the Obi. It inhabits woods, and cannot exist without free access to water. The islands of the delta of the Ganges have long been celebrated as a haunt of tigers. The T. generally lies concealed in a thicket during the day, and seeks its prey by night. The prey is very often obtained by watching near the places to which animals resort for the purpose of drinking. Tigers prowl about villages, and enter cattle-folds; they also follow travelling-parties, and seize the yoke-oxen and buffaloes, particularly those which straggle away from the encampment at night. The ravages of tigers in some parts of the East Indies are very great; and a great number of human beings are destroyed by them. A notion prevails that a T. which has once tasted human flesh becomes eager for it, and prefers it to all other food; and a single T. has been known to kill and devour many people, watching near some frequented path, or prowling around a village. The truth appears to be that this is the mode of obtaining prey to which a T. sometimes resorts, when incapable, through old age, of the active exertion necessary for capturing buffaloes or deer. The T. brings forth three, four, or five young ones at a birth. When taken young, it is easily tamed, and often shews much affection for those who treat it with kindness. Tame tigers are not unfrequently to be seen in India.

The T. was less familiarly known to the ancients than the large African *Felidæ*. It is, however, mentioned by Aristotle, and it is frequently mentioned by the Latin poets. Pliny tells us that the first T. seen at Rome was a tame one belonging to Augustus. Claudius exhibited four tigers at once.

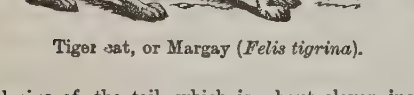
The T. frequently breeds in captivity, but not so frequently as the lion. A hybrid between the lion and T., the offspring of the male lion and the tigress, has been sometimes produced in menageries. It is striped like the T., and not maned. None of the hybrid cubs, however, have lived long.

Tiger-hunting is a favourite Indian sport, not unattended with danger, but all the more exciting on that account. Europeans generally ride on elephants when engaged in it, and the T. is shot from the back of the elephant. Natives, however, are employed to beat the wood or jungle for the

T., and lives are not unfrequently lost; but the destruction of a single T. is sometimes a thing of importance to a whole village or neighbourhood. The East India Company formerly gave a reward of ten rupees for every T. killed. In most parts of India, tigers are now much less numerous than they once were. Many expedients, of which the following are the chief, are adopted for their destruction in the countries infested by them. Bows with poisoned arrows are fixed in their paths, so as to be discharged on being touched. Heavy beams are also so placed as to fall upon the T. pressing against a rope, and crush it by their weight. Traps of various kinds are set, sometimes baited with a live goat or other small animal. The Chinese use a box-trap with a looking-glass placed in it, and the T., attracted by his own image, disengages the fastening of the lid, and is captured. This method is very ancient, and is represented in ancient sculpture. A very curious mode, practised in Oude, consists in scattering numbers of broad leaves smeared with a substance like bird-lime in the tiger's path, and if he sets foot on a smeared leaf, his fate may be regarded as sealed. He rubs his paw on his face, to get quit of the leaf, and the case becomes worse, the leaves are transferred to his face; fresh attempts to remove the nuisance only add more leaves, till he becomes completely blinded, and rolls on the ground for very rage; while the hunters, ambushed close by, apprised by his howlings, hasten to despatch him.

The T. is an emblem of power in the East. A tiger's head, gorgeously adorned with jewels, decorated the throne of Hyder Ali and Tippoo Sahib, and was among the spoils taken by the British at Seringapatam.

TIGER-CAT, a name often given to some of the *Felidæ* of middling size, which resemble the tiger in their form or markings. The Ocelots (q. v.) and the Serval (q. v.) sometimes receive this name, which, however, is not of very definite signification. The CHATI (*Felis mitis*) is a tiger-cat of South America, rather more than two feet in length,



Tiger cat, or Margay (*Felis tigrina*).

exclusive of the tail, which is about eleven inches. The colour is yellowish, with irregular dark patches, those on the back forming four longitudinal rows; the markings, indeed, more leopard-like than tiger-like. The chati prowls by night, and often carries away poultry from their roosting-places. Almost all tropical and sub-tropical countries have their tiger-cats. Several species are found in the East Indies.

TIGER-FLOWER (*Tigridia pavonia*), a plant of the natural order *Iridaceæ*, the only known species of its genus, which is distinguished by the three outer segments of the perianth being larger, and by the filaments being united into a long cylinder. It is a native of Mexico, but hardy enough to endure the climate of Britain, and much cultivated in flower-gardens for the singularity and great beauty of its flowers, which are, however, very evanescent. The root is a scaly bulb.

TI'GRIS (Heb. *Hiddekel;* i.e., the 'Dekel,' equivalent to *Digla* or *Diglath*, probably a Semitic corruption of *Tigra*, Medo-Persic for an arrow; hence Gr. *Tigris*, the 'arrowy' stream), a large river of Asiatic Turkey, rises south of Lake Goljik, in the mountains of Kurdistan, within a few miles of the eastern bend of the Euphrates (q. v.), flows south-east to Diarbekir, after which it makes a sharp turn, and flows due east for 100 miles to Til. Here it receives from the north a considerable affluent, the Bitlis, and once more altering its course, runs in a south-easterly direction through desert wastes and unpeopled pastures, until it falls into the Persian Gulf, after a course estimated at 1150 miles. Its chief tributaries, beside the Bitlis, are the Great and Little Zab, and the Dyala, all from the left, the waste land between it and the Euphrates (ancient Mesopotamia) not furnishing a single stream. At Kurna it joins the Euphrates, 90 miles above the mouth of that river in the Persian Gulf, and henceforth the united rivers bear the name of Shat-el-Arab (see EUPHRATES). In the upper part of its course, the T. is a very swift stream, whence probably its name, and it brings down great quantities of mud. The principal places on its banks are Diarbekir, Mosul, and Bagdad, with the ruins of Nineveh, Seleucia, and Ctesiphon.

TI'LBURG, a flourishing trading and manufacturing town in the Netherlands, province of North Brabant, is 15 miles south-west from 'sHertogenbosch, and 14 east-south-east of Breda. Its pop. is about 30,000, having more than doubled within 50 years. This prosperity began with the late King William II., when Prince of Orange, and commander of the army, taking up his headquarters at T., during the long contest which ended in the independence of Belgium. Much heath has been converted into arable and pasture lands, and numerous brick-works and woollen-cloth factories have arisen. In 1847, there were 13 wool-spinning works with steam-power; they now number 32, and the workers have increased from 2900 to 5000. The workmen's houses have each a strip of land attached, for the growth of vegetables and potatoes. Weaving woollen cloth, spinning, finishing and dyeing woollen fabrics, making soap, salt, tiles, bricks, and beer, are the principal industries. The chief buildings are the new palace, the town-house, the barracks, and the cloth-hall. T. has a high school with a course of five years, a drawing-school, and several charitable institutions. The people are nearly all Roman Catholics. The town is mentioned as early as 709.

TI'LBURY FORT, in Essex, is situated on the north bank of the Thames, opposite to Gravesend. Originally erected in the time of Henry VIII. as a block-house, it was converted (1667) into a regular fortification after the bold expedition of De Ruyter into the Thames and Medway. It is of a rectangular form, built chiefly of brick, with a massive stone portal, and is surrounded by a deep and wide fosse, which can easily be filled with water. Batteries of heavy ordnance are placed so as to command the river and the reach below; there are also piers for the landing of troops, stores, &c. The banks of the Thames being here very flat, the ground around the fort is during floods and high tides laid under water, and the atmosphere of the place is in consequence far from salubrious.

TILES (Lat. *tegula*, from *teg-*, to cover; Fr. *tuile*), plates of baked clay, of various shapes, according to their use, some being for roofs, some for pavements. The finer kinds of paving-tiles are known as Encaustic Tiles (q. v.). The small

cubical pieces of burnt clay, stone, glass, or other material used for mosaic pavements, are called tesseræ (Gr. *tessares*, four). See MOSAIC. Besides ornamental tiles, much improvement has been lately effected by various manufacturers in the different kinds used for roofing purposes, especially by the use of fire-clay, by which a tile is made not only greatly superior in strength and durability, but also in sharpness of form and diminution of thickness. Ridge-tiles of a very ornamental character are also largely made. Drain-tiles have been described under the head of PIPES.

TI'LESTONES, the uppermost group of the Silurian period, consisting of a reddish, thin-bedded, slightly micaceous sandstone, which in some places attains a thickness of 1000 feet. The beds were originally considered as of Old Red Sandstone age; then they were regarded as a transition group, forming a passage from the Silurian strata to the Old Red Sandstone; but it is now ascertained that the fossils agree in great part specifically, and in general character entirely, with those of the underlying Upper Ludlow Rocks, and they are accordingly considered to be the newest group of the Upper Silurian division. The Tilestones are well seen at Kington in Herefordshire, and at Downton Castle near Ludlow, where they are quarried for building purposes. From the latter locality, they have received the name of the Downton Sandstones.

TILIA'CEÆ, a natural order of exogenous plants, of which nearly 400 species are known, mostly trees and shrubs, with a few herbaceous plants. They are mostly natives of the tropics. A few are found in the temperate parts of the northern hemisphere. They have simple, alternate leaves, with stipules, and axillary flowers. The calyx is usually of four or five sepals; the corolla, of four or five petals. The corolla is sometimes wanting. The stamens are generally numerous, hypogynous, distinct; the outer ones sometimes abortive and petal-like. The ovary is composed of 2—10 carpels; there is one style, and the stigmas are equal in number to the carpels. As the characters somewhat correspond with those of *Malvaceæ*, so do the properties of the order, which are generally mucilaginous and wholesome, the bark fibrous. Some yield a light and useful timber, as the Lime (q. v.) or Linden tree, a well-known European representative of the order, the Halmalille (q. v.) of Ceylon, the *Grewia elastica* of India, and the *Luehia divaricata* of Brazil. The *bast* of the lime-tree is valuable from its fibrous character; that of the species of Grewia is used in the same way in India, and that of all the species of *Apeiba* in South America. The most important fibrous plants of the order, however, are the species of *Corchorus* (q. v.), which yield Jute (q. v.).

TILL, a term employed, chiefly in Scotland, for the Boulder-clay (q. v.). See also PLEISTOCENE.

TILLA'NDSIA. See BROMELIACEÆ.

TILLEMONT, SEBASTIAN LE NAIN DE, the well-known ecclesiastical historian, was born at Paris, November 30, 1637. His father was Jean le Nain, who held the office of *Maître des Requêtes*, the title, De Tillemont, by which the historian is commonly known, being derived from a small estate near Vincennes, which belonged to his family. He was educated at Port Royal, where he early imbibed those serious and rigorous views of the spiritual life which characterised the members of that celebrated society. His theological studies were marked from the first by a spirit of inquiry into the writings of the Fathers; and he is said to have begun as a student those analyses of the works of the Fathers, especially of the Apostolic Fathers, which form the staple of the early volumes of his History. Naturally of a timidly scrupulous disposition, he hesitated long about the choice of a profession; but after various changes of life, he at last received subdeacon's orders in 1672, being then 35. He deferred his ordination as deacon till the end of 1673; nor was it till 1676 that he was ordained a priest, mainly at the persuasion of his friend, Le Maistre de Sacy, who had long been his spiritual adviser, and with whose attachment to the Jansenistic principles he sympathised at least to a certain extent. In 1679, T. took up his residence at his family estate of Tillemont, where he resided till 1681. In that year, he made a visit to Holland and the Low Countries, for the purpose of visiting Arnauld and the other Jansenist refugees. He was induced, in the following year, to undertake a parochial charge—that of St Lambert; but he held it only for a short time.

During these years, he had steadily pursued the historical studies which he had commenced almost during his school-days; and he had now prepared the first portion of his long-projected work on the History of the Church. He was induced, on the very eve of printing, to change the plan of the work. In order to avoid the opposition of the censor, to whom, as a theological work, it would have been necessary to submit it in its first form, and whose suspicions were aroused by the known association of T. with the Jansenist party, T. separated from the Church History the History of the Emperors, which he was enabled to print as a distinct work, without referring it to the censorship, under the title *Histoire des Empereurs* (6 vols. 4to, 1690). The success of this work disarmed the opposition of the church authorities. The hostile censor was replaced by a less exacting one; and eventually, in 1693, the first volume of the Church History appeared under the title *Mémoires pour servir à l'Histoire Ecclésiastique des six Premiers Siècles* (16 vols. 4to). Neither of these works, however, was completed during the author's lifetime. Only four out of the six volumes of the *Emperors*, and four out of the sixteen of the *Histoire Ecclésiastique*, were printed under his own care. The remaining volumes were completed by him, but did not appear till after his death. The *Emperors* comprises all the reigns from Augustus to Anastasius (518); the *Histoire Ecclésiastique* comes down to about the same period. The plan of both is very much the same, being in great part a compilation of the original writers, as far as possible in their own words, but arranged with great skill and judgment, and linked together by such explanations and such a chain of narrative (within brackets) as is necessary to render them intelligible, and to carry on the course of events in a connected recital. Both these works have maintained, even to this day, their reputation for learning and impartiality; and even in the acrimonious contests of the 17th c., there was but little impeachment of T.'s orthodoxy, so far as the Histories are concerned. His other writings, left in manuscript, were for the most part used as materials by later compilers. Some of his letters have been appended to his *Life*, published by his friend Tronchet, canon of Laval (Cologne, 1711). T. died at Paris on the 10th January 1698, having just entered upon his 61st year. The extent and accuracy of his erudition are still freely acknowledged, and his authorities have supplied the materials of most of the church histories compiled since his time.

TILLER. See HELM.

TILLOTSON, JOHN, Archbishop of Canterbury was the son of a clothier, and was born at Sowerby, in Yorkshire, in 1630. His father, Mr Robert Tillotson, was a zealous Puritan—a circumstance

that is not a little curious, when we consider that the son ultimately turned out the most catholic churchman of his age. T. studied at Clare Hall, Cambridge, where he took the degree of B.A. in 1650, and of M.A. in 1654. The writings of Chillingworth are said to have exercised a powerful influence on his mind during his university curriculum; but he owed not less to his friendly intercourse with Cudworth, More, Rust, Smith, Wilkins, and other eminent scholars. In 1656, he became private tutor in the house of Edmund Prideaux of Ford Abbey, Devonshire, Attorney-general under the Protector, but appears to have returned to London shortly before Cromwell's death. At what time T. entered into orders, or who ordained him, is not known, but he was a preacher in 1661—attached apparently to the Presbyterian party in the Church of England, for at the famous Savoy Conference (q. v.) he was present on the Presbyterian side; but he submitted at once to the Act of Uniformity (1662); and in December of that year, was offered the church of St Mary Aldermanbury, London, of which Edmund Calamy had been deprived; but declined it. In 1663, he was appointed to the rectory of Keddington in Suffolk; but almost immediately after, was chosen preacher at Lincoln's Inn, where his mild, evangelical, but *un*doctrinal morality was at first little relished. 'Since Mr Tillotson came,' said the Benchers, 'Jesus Christ has not been preached among us.' However, as the graces of his character gradually displayed themselves, his popularity increased, especially when it was found, that although not a Puritan, he was nevertheless averse to atheism and popery. In 1664, he published a sermon *On the Wisdom of being Religious;* and in 1666, *The Rule of Faith*, in reply to a work by an English clergyman named Sargeant, who had gone over to the Church of Rome. About the same period, he took the degree of D.D.; and in 1670, was made a prebend of Canterbury. Two years later, he was promoted to a deanery; and in 1680, published a somewhat notable sermon entitled *The Protestant Religion vindicated from the Charge of Singularity and Novelty*, in which he advanced the proposition, untenable by a Protestant, that 'no man is at liberty to affront (i. e., to attack) the established religion of a nation, though it be false.' This proposition he subsequently, on reflection, abandoned. Along with Burnet, he attended Lord Russell during his imprisonment for complicity in the Rye-house Plot; and on the accession of William III., rose high into favour. In 1689, he was appointed Clerk of the Closet to the king; and in April 1691, was raised to the see of Canterbury, vacant by the deposition of Sancroft (q. v.), after vainly imploring William to spare him an honour which he foreboded would bring him no peace. Nor was he mistaken in his painful presentiment. The non-juring party pursued him with unrelenting rage to the end of his life; but their animosity could not extract one murmur of complaint, or one vindictive retaliation from the meek, humane, and tolerant primate. He did not long enjoy his dignity, dying of palsy, 18th November 1694, at the age of 65. A collected edition of his *Sermons* was published after his death by his chaplain, Dr Barker; and has been frequently reprinted. They were translated into German by Mosheim; and were long highly popular on account of their clear, solid, and refined thought, their easy eloquence, and their humane and moral piety. T.'s life was written by Dr T. Birch (Lond. 1752).

TILLY, John Tzerclas, Count of, one of the greatest captains of the 17th c., was born in 1559, at the château of Tilly in Brabant. A pupil of the Jesuits, his natural sternness of character inclined him to embrace their fanatical ideas; and this bent of mind was fixed by the examples of Alba (q. v.) and Requesens, under whom he was initiated into the art of war in the Low Countries. After a term of distinguished service in Hungary against the Turks, he was appointed (1609) by Duke Maximilian of Bavaria to reorganise his army, but resigned this post to take the command of the Catholic army at the outbreak of the Thirty Years' War (q. v.), and in conjunction with Duke Maximilian gained (8th November 1620) the battle of Prague, which dissipated the ambitious dreams of the Elector-palatine. During the course of this war, he separated, by able strategy, the armies of Mansfeld and of the Markgraf of Baden, beat the latter at Wimpfen, expelled Christian of Brunswick from the Palatinate (1622), defeating him at Höchst (22d July 1622) and at Stadion (August 1623); the latter conflict, which was of the most desperate character, lasting for three days. Created a count of the empire, he was next opposed to the king of Denmark, whom he conquered at Lutter (17th August 1626), and in conjunction with Wallenstein, compelled to sign the shameful treaty of Lübeck (1629). In the following year, he succeeded Wallenstein as commander-in-chief of the imperial forces, and took by storm the town of Magdeburg (10th May 1631). The unheard-of atrocities which he allowed the Croats and Walloons of his army to perpetrate on this occasion, have affixed to his otherwise high reputation a foul blot, ineffaceable by all the cosmetic arts of his numerous apologists. On the 14th May, he made a solemn entry into the ruined city, attended the celebration of a *Te Deum* in the cathedral, and then sent to the emperor a despatch in which occurs the remarkable passage: 'Since the capture of Troy, and the destruction of Jerusalem, a victory such as this has never been seen!' From this time, however, fortune deserted him; for his next opponent was the great Gustavus Adolphus, who completely routed him at Breitenfeld (17th September 1631); and though, in the following spring, he obtained some minor successes over the Swedish general Horn, the king speedily forced him to retreat behind the Lech in Bavaria, and (5th April) forced the passage of the river right in his front, after a desperate conflict, in which T. was mortally wounded. He was removed to Ingolstadt, where he died, 30th April 1632. T., the victor in 36 battles, was reckoned the best general of the time till his defeat by the Swedes; he was small in stature, and of a meagre habit of body, with a stern and energetic cast of countenance. Sober and continent, a despiser of luxury and wealth, his zealous support of the Catholic party was entirely founded upon fanatical zeal for the supremacy of a religion which he regarded with more than monkish devotion.

TIL-SEED. See Sesamum.

TI'LSIT, a town of Prussia, in the province of Prussia, on the left bank of the Memel or Niemen 65 miles north-east of Königsberg. Pop. 19,476. It stands in a fruitful district, called the Tilsit Flat, has broad streets, and a cleanly appearance. Its castle and town-hall are the chief buildings. It carries on an active transit-trade with Russia, besides considerable trade in timber, corn, butter, cheese, and Russian products, and has paper, sugar, and oil-mills. T. will be ever memorable in history for the treaties which were there signed between France and Russia on 7th July, and France and Prussia on 9th July, 1807. By the former of these Napoleon agreed to restore to the king of Prussia a great portion of his dominions, his Polish

acquisitions being joined to Saxony (see POLAND), and his possessions west of the Elbe formed into the nucleus of the new kingdom of Westphalia; Danzig was declared an independent city; the Prussian province of Bialystok was ceded to Russia; the dukes of Oldenburg and Mecklenburg, the czar's relatives, were reinstated by Napoleon, and in return, the Bonapartist kings of Naples and Holland were recognised by the czar; &c. By the latter, the king of Prussia recognised the kings of Holland, Naples, and Westphalia, and the Confederation of the Rhine, agreed to the cessions laid down in the Russian treaty, and to other minor alienations and concessions to Saxony, amounting in all to nearly one half of his dominions; to the exclusion from his harbours of the commerce of Great Britain, and to the occupation of the Prussian fortresses by the French, till the payment of an enormous ransom. The weighty importance of the alterations effected by this treaty is, however, dwarfed before the startling magnitude of the *secret provisions* signed between France and Russia. By these were arranged the resignation of the empire of the East to Russia, Roumelia and Constantinople being specially excepted by Napoleon, and the acquisition of the Spanish peninsula by France; the two powers were to make common cause against Great Britain, and were to force the three courts of Stockholm, Copenhagen, and Lisbon to join them; and Napoleon agreed to increase no further the power of the duchy of Warsaw, and to do nothing which might lead to the re-establishment of the Polish monarchy. By a further agreement, not put formally into writing, the mouths of the Cattaro, the Ionian Isles, Sicily, Malta, Egypt, and the papal dominions were to be taken by France; and Greece, Macedonia, Dalmatia, and the Adriatic coasts, on the partition of Turkey; while on the other hand, Russia was to obtain the rest of Turkey, and was allowed to seize Finland. These secret articles are given on most excellent authority, and their correctness is further vouched for by the conduct of France and Russia for the next few years.

TIMBER, a general term applied to all wood used for purposes of construction. Most of these have been described under their respective names; but the following tabular statement will shew the value of some of the leading sorts of colonial timber which are now beginning to be imported into Britain:

Name.	Colony whence imported.	Breaking Strain of Specimens two in. sq. by twelve in. long.	Specific Gravity.
		lbs.	
Iron-wood,	Jamaica	14,991·2	
Greenheart,	B. Guiana	12,215·6	1·089
Hickory,	N. S. Wales	7,795·4	
Mora,	B. Guiana	9,700·2	0·922
Water-gum,	N. S. Wales	7,760·1	
Blue-gum,	N. S. Wales	7,167·1	0·843
Bully Tree,	Jamaica	6,724·0	
Purple-heart,	B. Guiana	6,393·3	
Locust Tree,	B. Guiana	6,062·7	
Stringy-bark,	N. S. Wales	5,795·9	
Cedar,	Jamaica	3,196·7	
Yacca,	Jamaica	2,204·6	

The trade in timber is, of course, very extensive. Besides that grown in Great Britain, there is annually imported from the colonies and foreign countries an enormous quantity. Of fir, the imports in 1865 were 4,014,655 loads, of which rather more than one-half was from the North American colonies, and the remainder from foreign countries; of oak, 490,826 loads, of which 230,000 loads were from foreign countries; and of miscellaneous kinds, 2,706,480 loads—the load being 50 cubic feet; the total value of all of which was, in round numbers 12½ millions sterling.

TIMBER, in point of English Law, when growing on land, belongs to the owner of the land; or in case of a lease, to the landlord. In the case of a life-estate in the lands, the tenant for life, unless restrained by covenant or agreement, is entitled to estovers or botes; i. e., wood necessary to repair or burn in the house, and to repair hedges and fences. But the tenant for life cannot commit voluntary waste by felling trees. If the timber is in such an advanced state that it would be injured by standing longer, the Court of Chancery has power to grant leave to sell it, in which event the principal of the price will belong to the reversioner, and the interest thereof to the tenant for life. If, however, the estate for life is declared to be given without Impeachment of Waste (q. v.), as is often the case, then the tenant for life may cut timber to a certain extent with impunity. The tenant for life is entitled to all timber that is blown down on the estate. With regard to ordinary tenants or lessees of lands, though the timber is part of the inheritance, and belongs to the landlord, yet the tenant may cut down the underwood, and take sufficient estovers, or wood, to do repairs. Timber is also protected against third parties who steal or injure it. Thus, whoever steals, cuts, breaks, or damages trees with intent to steal them, provided the injury exceed one shilling in value, incurs a penalty of £5; and on repeating the offence, imprisonment may be added: so whoever unlawfully and maliciously cuts, breaks, barks, or otherwise destroys trees to the value of one shilling and upwards, forfeits £5, or may be imprisoned, in addition to, or as a substitute for such payment, with increased punishment for repeated offences of the same description.

TIMBERS of a ship are the upright ribs, based on the keel, and rising to the gunwale, on which the planking is fastened. See SHIP-BUILDING.

TIMBER TREES. Trees valuable for their timber are very numerous, and are found in all the warm and temperate parts of the world, except where the aridity of the soil, or the sea-breeze, prevents their growth. They belong to very many and widely different natural orders, all of which, however, are orders of Phanerogamous plants; the only Cryptogamous plants which assume the form of trees being the Tree Ferns (q. v.), none of which yield valuable timber. Of Endogenous plants, none have any claim to be mentioned among timber trees, except some of the Palms (q. v.); the only other endogens, indeed, which can be called trees being a very few of the *Liliaceæ*, as the Dragon Tree. See DRAGON'S BLOOD. Of Gymnogens, the *Coniferæ* are in general of some value for their timber, and some of them are amongst the most useful of all timber trees, as the different kinds of Fir and Pine. A far greater number of timber trees, however, are true exogens, as the Oak, Ash, Elm, Beech, Sycamore, &c., in the colder temperate zone; the Chestnut and Walnut among those of the warmer temperate; the Mahogany, Teak, &c., among those of tropical countries. It is impossible, within our space, to attempt an enumeration. Notice is taken of the most valuable timber trees of different countries in the articles on these countries; of those belonging to particular natural orders, in the articles on these orders; and the most valuable kinds are noticed in separate articles. For the cultivation of timber trees, see the article ARBORICULTURE. Some trees, of comparatively small size, are valuable on account of the quality of their timber, which is used for veneering, or for turnery Some trees, chiefly valuable as fruit trees, may also

be reckoned amongst timber trees, although not of great importance, of which the apple tree may be mentioned as an instance.

TI'MBREL (Spanish *tamburil*), a small musical instrument, of the drum species, in use in ancient times, which was carried in the hand, and was apparently not unlike the modern Tambourine (q. v.), with or without bells.

TIMBU'KTU, a famous city of Sudan, occupies a position of the highest commercial importance on the great north-western bend of the Niger; lat. 17° 37′ N., long. 3° 5′ W. It stands only a few feet above the level of the Niger, and at a distance of about six miles from the principal branch of that river, is triangular in shape, is from 2½ to 3 miles in circumference, and at present without walls, though in former times it covered a much greater area, and was defended by walls. It is laid out mostly in straight, but partly in winding streets of hard sand and gravel, and having a sort of gutter in the middle. There are three chief squares. There are about 980 clay houses — some low and unseemly, and others rising to two stories, and exhibiting considerable architectural adornment—and about 200 huts of matting, almost all in good repair. In the north of the city is the mosque of Sánkoré, an edifice of great grandeur, and which imparts an imposing character to the whole district in which it stands; and the other chief buildings are the 'Great Mosque,' an immense edifice of stately appearance, 286 feet in length, by 212 feet in width; and a few other mosques. The climate is not considered very healthy. T. is not a manufacturing town, almost the whole life of the city being based upon foreign commerce, for which its situation renders it the most favoured centre. The quantity of corn raised here is much too small to supply local consumption, and almost all the victuals used are imported by water-carriage from Sansanding, on the Upper Niger. The only manufactures carried on are blacksmiths' work, and articles in leather, especially luggage-bags, cushions, tobacco-pouches, and guncovers. Most of the clothing sold here is imported from Kano, Sansanding, and England. There are three great highways for foreign commerce to the city of T.—down the river from the south-west, and by two roads from the north, from Morocco and Ghadames respectively. Of this commerce, gold, which arrives at this place chiefly in the form of rings, is the staple; and the amount which the city exports is set down at about £20,000 yearly. Salt, and the kola-nut, which is used in place of coffee (see Tea), are also largely imported and re-exported, as are also tobacco and dates. Rice and corn are brought from Sansanding; English manufactures, consisting of red cloth, sashes, looking-glasses, cutlery, and calico, arrive from the north and north-west. The regular pop. of T. is 13,000; with floating pop., during the months of the greatest traffic and intercourse, from 18,000 to 23,000.

T. was founded about the end of the 11th c., and first became known to Europeans in 1373.—Barth's *Travels in Central Africa*, 1858.

TIME, in Music, is used in three different senses: 1. The relative duration of musical sounds as measured by the rhythmical proportion of the different notes, a minim being half of a semibreve; a crotchet, half of a minim; a quaver, half of a crotchet, &c. 2. The division into measures or bars, and the division of each measure into equal parts, and subdivision of these parts; the different combinations of sounds into equal measures and values being said to form different kinds of time, each indicated by a distinct rhythmical signature. 3. The degree of movement—that is, the absolute, and not relative velocity, which is now more generally expressed by the Italian word *tempo*.—For time in the first two senses, see Rhythm; in the third sense, Tempo.

TIMES, The, is the largest and most important daily newspaper in England and in the world. It was founded towards the end of the last century by Mr John Walter, a London printer. In January 1785, he established *The Daily Universal Register*, which he continued to publish until January 1788, when he changed the name to *The Times, or Daily Universal Register*, afterwards shortened to the *Times*. The publication, until the close of the century, remained undistinguished by any extraordinary merit or success. But in 1803, a son of Mr Walter, also named John, became joint-proprietor and sole manager; and under his guidance it soon became remarkable for the accuracy and freshness of its news, and the independence with which it expressed opinions on social and political questions. Reporters and correspondents were engaged with great discrimination, and their best services were secured by prompt and liberal remuneration. The younger Mr Walter acted himself as manager and editor. In 1805, the *Times* made an attack on Lord Melville's administration at the Admiralty, and the Walter family were in consequence deprived of the lucrative post of printers to the Board of Customs, which they had held for 18 years. At that time, there was, in consequence of the war, a great demand for continental news. The letters of the *Times*' correspondents abroad were transmitted through the regular channels, but the packets were stopped by the government, and Mr Walter was informed that he would be supplied as a favour, like the other newspapers, with official information. He declined to avail himself of this offer, and it was then he took means to secure the special and early transmission of news for his paper. His success was remarkable; and on many occasions the public dispatches were anticipated. Thus, the *Times* announced the capitulation of Flushing two days, and the result of the battle of Waterloo some hours, before the arrival of the regular dispatches. An increased circulation was the reward of these efforts, and the only limit to the increase of circulation was the impossibility of throwing off a sufficient number of copies of the paper by the hand-printing press. Mr Walter saw the importance of introducing steam-printing, and so early as 1804, he encouraged an ingenious compositor, named Martyn, to complete a machine he had invented; but Mr Walter the elder, who was then alive, was less sanguine, and the scheme fell to the ground. Some years later, Frederick Koenig, a German, invented and patented a new press, which could be worked by the steam-engine, and Mr Walter became his patron. He gave him, in 1814, an order for two machines, which, in anticipation of opposition on the part of the pressmen, were put up in premises adjoining the office. On November 29, in the same year, it was announced to these men that the paper had been printed by steam, and that there was no further occasion for their services. It is very creditable to the proprietors of the *Times* that no advantage was taken of the violent language used by the workmen on this occasion, and that their wages continued to be paid while they remained without employment. Under the old mode of going to press, about 250 copies could be printed per hour; but with the new machine it was possible to take 1100 impressions in the same time, so that the *Times* had a means of increasing its circulation not at the command of the other newspapers. From this time, Mr Walter intrusted the superintendence of the literary department of the

paper to Mr Thomas Barnes, the first editor, born in 1785, who remained in the same situation until his death in May 1841. Mr Barnes wrote few articles, but he fixed on the subjects to be discussed, and displayed great ability in giving uniformity of tone and point to the articles passing through his hands. It was during his editorship that a series of leaders by Mr Edward Sterling obtained for the paper new political and social influence, recognised by the name then applied to it, of 'the Thunderer.' It was in his time, too (1834), that O'Connell attacked the accuracy of the *Times*' reports of the parliamentary debates, and was signally defeated by the testimony of those whose speeches were said to have been tampered with.

In 1841, Mr John T. Delane succeeded Mr Barnes as editor, and continued to conduct the paper until 1877, when he resigned, and was succeeded by Mr Chenery. It was in 1841 that the *Times*, which had always sought to obtain the most accurate commercial intelligence, won a new title to the confidence of the mercantile community, by the detection of a great scheme to defraud the leading banking-houses. If Mr O'Reilly, the Paris correspondent, had not discovered the conspiracy, which was headed by a French baron, and other persons holding a good position in society, it was shewn that the leading banking-houses would have been defrauded to the extent of a million sterling. The *Times* did not altogether escape punishment. It had to defend an action at law, in which, although a verdict for a farthing of damages only was given, the defendants were obliged to pay their own costs. To relieve them of this burden, £2700 were in a very short time subscribed by the bankers and merchants chiefly of the city of London. The offer of this sum was declined, and it was in consequence employed in another way, to commemorate the event which had led to its being collected. Two sums of £1000 each were devoted to found *Times*' scholarships at Oxford and Cambridge in connection with Christ's Hospital and the City of London School; and the balance was employed to erect marble tablets at the *Times*' office and the Royal Exchange, recording the obligations the mercantile community were under to the proprietors for the generous manner in which their interests had been protected. After the death of Mr Barnes, Mr Walter did not relax his efforts to obtain early intelligence. In 1842, a remarkable instance of the trouble and expense he incurred with this view, was brought under public notice. The news of the massacre in the Cabul Pass was first made known in the *Times*. The correspondent's letter containing it had been forwarded from Marseille to Paris by carriages specially hired; from Paris to Boulogne by horse; thence to Dover by the steamer belonging to the newspaper (which had been for days in the Channel with steam up); and from Dover to London again by horse. The letter reached the *Times*' office at 2 o'clock on Sunday afternoon, and was immediately put in the hands of compositors, who had been kept in attendance from the preceding day, in expectation of its arrival. The only news of the event which had reached England at the meeting of the House of Commons next day was that contained in the *Times*, and it was at once assumed by the government as having all the authenticity of a dispatch received by the ordinary channels. The cost of conveying this letter from Marseille to London was upwards of £300. The most remarkable events in the history of the *Times* since this period are the publication of the letters from Mr W. H. Russell, the special correspondent, from the Crimea in 1854, from India in 1857, from America in 1861, and from Bohemia in 1866; the establishment of the *Times*' fund for the relief of the soldiers in the Crimea (£15,000 of which was collected in a fortnight); the formation of a fund, in 1858, for the relief of the homeless poor, when £8000 was collected in a few days for the destitute in London, and £20,000 for charitable institutions elsewhere. Within this period, important mechanical improvements were introduced in the printing-office, still further to hasten the publication of the paper; and now from 40,000 to 50,000 copies are thrown off per hour. The prosperity of the paper continues unabated, and may be fairly attributed to the literary merit of the leading articles—the value of correspondence like that describing the recent war in Bohemia, of which no satisfactory account appeared elsewhere, the accuracy of the reports, the care and good taste displayed in their revision, the respect with which honest opinion is treated, and above all, perhaps, to the absence of that sarcastic or abusive tone towards classes and sects, and that harsh literary criticism, by which other publications have obtained popularity.—See Chambers's *Book of Days*, vol. i. p. 607; vol. ii. pp. 137, 566, 567, 632, 633.

TIME-TABLES. See BRADSHAW'S GUIDE.

TIMO'LEON, a great Greek general, and the liberator of Sicily from the dominion of 'tyrants,' belonged to one of the noblest families of Corinth, and was born there about 394 B.C. T.'s brother Timophanes, having made himself tyrant of his native city, T. either killed him with his own hand, or caused him to be killed. Opinion was divided in Corinth as to the merit of this deed, one party extolling it as an act of the noblest patriotism, while the other demanded T.'s death as a murderer. The difficulty was got over by appointing him leader of a small band of mercenaries sent (344 B.C.) to Syracuse, the exiled citizens of which had begged assistance from Corinth, the mother-city, against the 'tyrant' Dionysius and the Carthaginians. Outwitting the Carthaginians, T. arrived safely at Tauromenium, where he was welcomed by the Syracusan exiles. Hicetas, 'tyrant' of Leontini, was then striving to dispossess Dionysius, and secure the tyranny of Syracuse for himself, and had succeeded in getting possession of the whole city except the island citadel. T., with only a fifth of the number, defeated him at Adranum; and marching to Syracuse, made himself master of two quarters of the city. From this time onwards, T.'s career in Sicily was one of complete victory over all opponents. Dionysius the Younger (q. v.), in 343 B.C., surrendered in despair the citadel of Syracuse, and was sent to Corinth. Hicetas having failed in the attempt to assassinate T., called in the assistance of a Carthaginian force of 50,000 men, which, however, was shortly after withdrawn by Mago, who had become suspicious of treachery. Hicetas at last fled to Leontini, leaving T. sole master of Syracuse. After repeopling the almost desolate city by recalling exiles, and inviting new colonists from Greece Italy, and Sicily, he spent the next two years in enacting laws and organising a constitution, which he put on a completely democratic footing. The Carthaginians, alarmed at the reviving power of Syracuse, and the prospect of union among the Sicilian Greeks, now sent an army of 80,000, under Hasdrubal and Hamilcar, to subdue the whole island. T., with only 12,000, encountered them (339 B.C.) on the Crimissus, and gained one of the greatest victories ever won by Greeks over barbarians. He now proceeded with his great project of expelling the tyrants of the other Greek cities, who, however, again called in the aid of the Carthaginians; but the successes of T. soon made the Carthaginians

glad to conclude a treaty, fixing the river Halycus as the boundary between their dominions and those of the Greeks. Hicetas, tyrant of Leontini, being now captured, was put to death with his wife and daughters; and shortly after, Mamercus of Catana suffered the same fate. T. thus in about six years freed Sicily from nearly all its tyrants, and conferred upon the cities free constitutions, himself all the time taking no advantage of the immense influence which he thus obtained. After his great work was accomplished, he lived among the Syracusans as a private citizen, receiving from them and from all the Greek world the greatest honour and respect: his advice was had recourse to by all the Sicilian cities in any emergency. He died in 337 or 335 B.C., having been blind for a considerable time previously; and was buried in the market-place of Syracuse, where a gymnasium, called the Timoleonteum, was afterwards erected over his tomb. T. was undoubtedly one of the greatest generals and noblest characters produced by Greece; he appears to have been thoroughly unselfish, and to have set before him as his great aim the abolition of tyranny, and the establishment of freedom.

TIMON THE MISANTHROPE was a native of Athens, and lived in the time of the Peloponnesian War (431—404 B.C.). The little that is known concerning him is learned chiefly from Aristophanes and the other comic writers who attacked him. Disgusted with mankind, on account of the ingratitude of his early friends and companions, he lived a life of almost total seclusion from society, his only visitor being the 'bold and insolent' Alcibiades. Numerous stories were current in antiquity regarding his eccentricities, one of which is, that he died because he would not allow a surgeon to visit him to set a limb. His grave, which was on the sea-shore, is said to have been planted with thorns, and to have been rendered inaccessible by the sea forming it into a small island.

> We know him out of Shakspeare's art,
> And those fine curses which he spoke—
> The Old Timon with his noble heart,
> That strongly loathing, greatly broke.
>
> TENNYSON.

'The Timon of Plutarch and of the popular stories of Shakspere's time was little different from the ordinary cynic. The Timon of Shakspere is essentially high-minded and generous, his all-absorbing defect—the root of those generous vices which wear the garb of virtue—being the entire want of discrimination. If Timon had possessed one friend with whom he could have exchanged confidence upon equal terms, he would have been saved from his fall, and certainly from his misanthropy.'—See Introductory Remarks to *Timon*, in Knight's Shakspere.

This T. must be distinguished from the Greek poet and philosopher of the same name, who lived about a century and a half later.

TIMO'R, the most important of the chain of islands which stretch eastward from Java, lies in 8° 16′—10° 25′ S. lat., and 125° 25′—127° 10′ E. long., has an area of 8820 sq. m., and pop. of about 400,000. A chain of wood-clad mountains runs throughout its entire length; Alas, on the south-east, being 11,800 feet in height; Lakaan, in 9° 10′ S. lat., 6175 feet; and Miomaffo, 4630. The prevailing rocks are of the graywacke formation, which, at the south base of Miomaffo, is cut by serpentine mountains of limestone; and calcareous rocks resembling ruins frequently occur. Magnetic iron, porphyry, syenite, gold, copper, malachite (containing 22 per cent. of pure copper), sulphur, and naphtha, are found.

The dry monsoon is from May to November, during which no rain falls. From November to April, there are daily storms of rain and wind from the north-west; the streams are swollen; the thermometer rises to 94°.4 F. in the shade; the earth is covered with a dark-green carpet, and myriads of insects come into life. The rivers are numerous but small, and most of them yield gold. Near the sea, are very fertile lands, on which are grown rice, maize, beans, tobacco, sugar-cane, cotton, potatoes, and all sorts of tropical fruits. There are many varieties of the palm, the lontar being useful for food and other purposes. Timber trees suited for masts attain a height of 100 feet, and from 3 to 4 in diameter; the wild nutmeg, cinnamon, and tamarind are plentiful; and bamboos make the forests impenetrable in many parts. About 600 species of plants are known, a great number being medicinal, and few poisonous. Indigo grows everywhere, and potatoes in the mountains.

Three-fourths of T. on the south-west is subject to the Dutch, whose chief settlement is Koepang (Kūpang); the remaining part in the north-east belongs to the Portuguese, who have a town called Dilly, on the north coast, with a safe roadstead, and a fort, which was nearly destroyed by an earthquake in 1857. T. is divided into small kingdoms, ruled by rajahs under Dutch or Portuguese control.

Koepang lies at the base of a semicircle of wooded hills, on a beautiful bay in the south-west. It is irregularly built, the principal buildings being the governor's house and the Protestant church. There is a Mohammedan and a Chinese temple, one Dutch, and two Malay schools. Pop. 3500, including 100 Europeans and 500 Chinese. Whalers and trading-ships from Sydney, Van Diemen's Land, &c., call for provisions on their way to or from Java and Singapore; and T. will be a convenient market for horses and supplies to the settlements in North Australia, which is only eight days' sailing distant.

The exports are—sandal-wood, horses, wax, tortoise-shell, edible nests, &c.; imports—cotton, woollen, and silk fabrics, provisions, and general supplies. Pearls are found on a bank 30 miles south-east from Koepang. The natives are partly Oceanian negroes, and partly of Malay race. They worship a supreme being called 'Lord of the Sun.' Near the Netherlands' settlements, some hundreds have been baptised, but missionary efforts have not been very successful. The fathers dispose of their daughters for gold and buffaloes, and polygamy prevails among the rich.

Koepang is the capital of the Netherlands' residency or government of T., which includes Samao, Rotti, Savu, the Sandal-wood Island, Sumbawa, Flores, Adanara, Solor, Lomblem, Ombay, and all the small islands belonging to the chain.

TIMO'R-LAUT, THE, or TENIMBER ISLANDS, lie east from Timor, in 6° 40′—8° 23′ S. lat., and 130° 26′—132° 2′ E. long., having an area of 3150 sq. m. Pop. 15,000. By far the largest island of the group is Timor-Laut, which is 78 miles in length, and 21 in breadth. The soil is rich, and covered with the most luxuriant vegetation, various palms and other useful trees growing in great abundance. At a little distance from the shore, mountains encircle the island.

The next in importance is Larat, the north-west point of which is in 7° 6′ S. lat., and 131° 47′ E. long. Area, 147 sq. m.; pop. 2500. It is also mountainous. Further north are Vorhate, Marū, and Molo. On the west of Timor-Laut are Selū and Sejrah; a multitude of smaller islands of coral formation being scattered around.

On the larger islands are small horned cattle, goats, swine, fowls, and a great variety of birds.

Nothing can exceed the beauty of the Blue-streaked Lory (*Eos reticulata*) and the Citron-crested Cockatoo (*Cacatua citrino-cristatus*). Fish are plentiful in the rivers of T. and surrounding seas, and there is a considerable export trade in tortoise-shell and Bêche-de-Mer (q. v.). English trading-ships from Singapore, and South-sea whalers, sometimes visit these islands, and not unfrequently have been treacherously attacked. The natives are tall, well made, fairer-complexioned, and have more regular features than the Alfoors. They are low in the scale of civilisation.

TIMOTHY, FIRST AND SECOND EPISTLES TO, form, along with the Epistle to Titus (q. v.), the three 'Pastoral Epistles,' the authorship of which is all but universally ascribed to St Paul. The external evidence for their genuineness is very strong, yet not complete. They occur in the Muratorian Canon and the Peshito version as writings of St Paul; Eusebius classes them among the *homologoumena;* while still earlier, Irenæus, Tertullian, and others of the Fathers quote them as authoritative. On the other hand, Tatian (q. v.), one of the earliest of the Fathers, denies their genuineness, as did also Marcion, Basilides, and most of the Gnostic teachers. Origen speaks of some who rejected 2d T. on account of the mention of 'Jannes and Jambres,' two apocryphal characters; while in modern times, Schleiermacher and Neander admit the Pauline origin of 2d T., and endeavour to disprove the genuineness of 1st. Eichhorn, De Wette, Baur, and others go further, and seek to demonstrate the spuriousness of the whole three Pastoral Epistles. They consider the language and mode of thought quite distinct from the Pauline, and they (particularly Eichhorn) find no period in the apostle's life to which they could be properly fitted in. Their conclusions, however, cannot be said to have seriously affected the convictions of scholars. The purpose and scope of the Epistles to T. are so well known, that an analysis, however slight, is almost superfluous. They consist of a series of warnings, exhortations, advices, and predictions.—See the 'Introductions' of Alford, Wordsworth, Davidson, Wiesinger, Hug; and the list of commentators on the 'Pastoral Epistles,' appended to the article on the Epistle to TITUS.

Timothy Grass (*Phleum pratense*).

TIMOTHY GRASS, the name commonly given to *Phleum pratense*, a grass much valued for feeding cattle. It first received the name T. G. in America, from the name of a person who did much to promote its cultivation there. Along with the other species of the genus, it often receives also the English name of CAT'S-TAIL GRASS. The genus *Phleum* is distinguished by a panicle so compact as to resemble a close spike, single-flowered spikelets, with two nearly equal acuminate or almost awned glumes, two awnless paleæ, and the seed free. The species are mostly natives of Europe; a number of them are British, but the T. G. alone is of any economical value. It varies very much in size according to soil and situation, succeeding best in moist rich soils. It is very extensively cultivated both in Britain and in America. It has strong culms, attaining a height of 4—5 feet, but is tender and nutritious, and much relished by cattle. It is perennial, but springs up rapidly, even in the year in which it is sown. Its spikelike panicle, from the form of which the name Cat's Tail has been given, is cylindrical, and often of several inches in length. The seed is very small.—*Phleum nodosum* is a very similar species, perhaps a mere variety, with the lower part of the culm prostrate and swollen into knots or bulbs; the spike much smaller than in *P. pratense.* It is a very inferior grass, and is found only on dry soils.

TIMUR, called also TIMUR-BEG and TIMUR-LENG from his lameness, and vulgarly known among western writers as TAMERLANE, was the second of the great conquerors whom Central Asia sent forth in the middle ages, and was born near Kesh (Shehri-Sebz), April 8, 1336. His biographers make him the fifth in descent from Karatchâr Nuyan, the relative and counsellor of Genghis Khan (q. v.), and the ninth from Tûmna Khan, the direct ancestor in the male line of his renowned predecessor. The royal line of Jagatai (see TURKESTAN) had so utterly degenerated that the real power was in the hands of a number of independent chiefs of Mongol blood, each of whom, choosing a prominent city of the kingdom, there set up his standard, and lorded it over the surrounding district. One of these chiefs, Hadji Berlas, the uncle of T., had established himself at Kesh, and here the future conqueror passed the first 24 years of his life in peaceful obscurity, devoting himself to the national amusements of hunting and equestrianism. But a formidable inroad (1360) of the Kalmucks of Jettah, who speedily subjugated Turkestan, expelling those chiefs who refused submission, effectually called forth T.'s hitherto untried energies. Declining to accompany his uncle in his flight, he boldly advanced with a small retinue to meet the invader, who was so charmed with his eloquence and address, that he at once confirmed him in the government of Kesh, and appointed him one of the principal ministers of his son, the new monarch of Turkestan. But neither chiefs nor people of the conquered country could long endure the tyranny of a race more cruel and barbarous than themselves, and the exiles and fugitives having been collected by the Ameir Husseyne, and joined by a powerful force under T., the Kalmucks were ultimately expelled in 1365, and Turkestan divided between its two liberators, who ruled together in the utmost harmony for some time; but war having arisen between them, Husseyne was defeated and slain, and T., by unanimous consent of the chiefs, was hailed as supreme lord of Turkestan. It was in the war against the Kalmucks that T. received the wound in the thigh which rendered him lame for the rest of his life. He did not, however, either then or afterwards, assume the rank of a sovereign, but elevating one of the royal race to the throne, reserved for himself the real authority and the title of *emir.* Having thus, in the space of ten years, risen, by dint of superior ability, to absolute authority over a numerous and warlike people, he proceeded to avenge his nation's wrongs on the Kalmucks of Jettah and Mogulistan; then turned westward to punish the predatory tribes of Khaurezm, who had plundered Bokhara; and spent the interval between these campaigns in supporting Toktemesh Khan, one of the claimants to the throne of Keptchak, ultimately (1376) placing him in undisputed possession. With the view of restoring its former

limits to the empire of Jagatai, he summoned the prince of Herat and the other chiefs of Northern Khorassan to attend a 'kouriltai;' and on their refusal, immediately attacked and reduced them to submission, levying a moderate contribution as a penalty. But soon after (1383), the people of Herat again rebelled, murdered the envoys whom he sent to remonstrate; and 2000 of the garrison, built up with an alternate layer of brick and mortar into the form of a pyramid, were left by T. as a horribly singular and effective reminder of the consequences of rebellion. Seistan was next reduced, the Afghans of Suliman Koh chastised, and T. returned, as was his wont, to spend the winter in the bosom of his family, at one or other of his numerous palaces near Samarkand. In the following year, he commenced his career of aggression by the invasion of Mazanderan; and by the close of 1387, the whole of the districts west of the Tigris, from Tiflis to Shiraz, were subdued; those chiefs who voluntarily submitted being mostly confirmed in their governments, while the inhabitants of Ispahan—who, after a pretended submission, suddenly rose upon the Tartar garrison, and massacred 3000 of them—were almost completely exterminated. Meanwhile, Toktemesh Khan, of Keptchak, took advantage of his absence to invade T.'s territories on the Amu-Daria; on which T. returned home, and, after driving the invaders out, pursued them to the head of the Tobol, then west across the Ural mountains and river, and though long baffled by the Arab tactics of his opponents, finally brought them to bay on the banks of the Bielaya (a tributary of the Kama), 18th June 1391, and almost wholly annihilated them. Resuming, in 1392, his conquering march westwards, he crossed the Tigris, subdued the numerous and warlike principalities to the east of the Euphrates, then advanced northwards, through the gates of Derbend, to the Volga, and again routed Toktemesh (who had ventured to resume hostilities), on the banks of the Terek (1395), turned west as far as the Dnieper, and then north to Moscow, returning by Astrakhan and the Caucasus, leaving death and desolation in his track. In 1398, T. campaigned in Hindustan, entering by the passes of the Hindu Koh, near Cabul, and routing *seriatim* the numerous armies collected to oppose him, till the number of prisoners became so great, that four days before the great battle before Delhi between T. and the Indian emperor, the former, as a precautionary measure, ordered the murder in cold blood of all the males (said to be 100,000 in number), and then, after totally routing his opponents, took the capital. After a further advance to the Ganges, and more military successes, T. retraced his steps to Samarkand, where the immense spoils of the expedition were expended in the adornment of the capital. T. returned to Western Asia in the following year, and attacked the Egyptian Empire in Syria, to avenge the murder of his ambassador, and the aid which the Mamluk sultan had given to his enemies. T. was as usual completely successful in the field; and the capture of Aleppo, Hama, Hems, Baalbek, and Damascus, equally proved his skill in the attack of fortified places. His mode of attack was to undermine the fortifications on all sides, then to fire the mines with wood steeped in naphtha, and on the destruction of the walls and battlements, which uniformly resulted, to charge in overwhelming force through the breaches. Similar conduct to that of the Mamluk sultan on the part of Sultan Bajazet I., drew from T. repeated remonstrances, which the other, in the overweening confidence springing from uninterrupted success, treated with contempt, and answered with insult; but the advance of the Tartars to his frontiers soon opened his eyes to the greatness of his error, and with a powerful army, he hastened to oppose them. The two hosts met at Angora (July 20, 1402), and after a long and obstinate contest, in which, although the generalship of Bajazet and the steadiness of 20,000 Servian auxiliaries long balanced the superiority of T.'s troops, the Turks were totally routed, and Bajazet captured. The conquest of the whole of Asia Minor speedily followed; the Byzantine emperor did submission to the victor, as did also the Turkish ruler of Thrace; and the Knights of St John were expelled from Smyrna. The unfortunate Bajazet died after a few months' captivity, though uniformly treated with the greatest consideration; and about the same time, T. commenced his return—receiving on the way a most satisfactory embassy from the Egyptian sultan, who was now glad to come to terms—conquering Georgia, where he passed the winter, and resuming his march in the following year by Merv and Balkh, reached Samarkand in 1404. Here he resumed preparations for the long projected invasion of China, continued the embellishment of the capital, and celebrated his great successes by the most gorgeous festivities. All things being now ready, he started with a large army for the Sihun, marched down that river to Otrar, where, being detained by the severity of the weather, he was attacked by an ague-fever, and died after a week's illness, February 17, 1405. T. holds a high position as a mere conqueror: his antagonists were mostly warlike and disciplined, and seldom much inferior in number; yet, from the savage horsemen of the Siberian steppes to the mailclad warriors of Servia, all were alike forced to bow before the invincible prowess of the Mongol conqueror. The charge of cruelty brought against him is completely established by the massacre in India, but opposite to this might be placed numerous instances of a lenity and forgiveness almost incredible in a 'barbarian.' He did much to promote the arts and sciences throughout his dominions, but the speedy dissolution of his empire deprived his labours of any permanent utility.—The principal authority for the life of T. is Sherif-ed-Din-Ali's *History* (in Persian), translated into French by Pétis de la Croix, under the title of *Histoire de Timur-Bec, connu sur le nom du grand Tamerlan* (4 vols., Par. 1722). Several writings exist in Persian, attributed to T., but are of doubtful authenticity. Among these are the *Institutions* (with an English translation and a valuable index, Oxford, 1783); and the *Commentaries* of T., translated from a MS. of Major Davy by Major Stewart, late Professor of Oriental Languages in the East India Company's College. See also a translation of the narrative of Clavijo, envoy of Henry III. of Castile to T., by C. R. Markham (Hakluyt Society, 1860).

TIN (symb. Sn,* equiv. 118, spec. grav. 7·29) is a beautiful silvery-white metal, with a tinge of yellowish blue, and a high metallic lustre. It possesses a crystallised texture, and may be obtained in well-formed crystals of the pyramidal or tetragonal system; and it is in consequence of this crystalline texture that a bar of tin, when bent, emits a creaking sound, termed the *cry* of tin (the *Zinngeschrei*, or tin-shriek of the Germans). Tin is a soft metal—being softer than gold—and is very malleable, and can be beaten out into very thin laminæ, in which form

* This symbol, as well as the word *stannic*, is derived from the Latin *stannum*, tin; the symbols T and Ti, either of which would at first sight seem more appropriate, being engaged to designate Terbium and Titanium respectively.

it is known as *tinfoil.* At a temperature of about 212°, its ductility is considerable, but by no means remarkable, and it may be then easily drawn into wire, the tenacity of which is only moderate, as a wire with a diameter of 0·17 of an inch is broken by a weight of about 50 lbs. It is a tolerably good conductor both of heat and electricity, and when handled communicates a peculiar odour to the skin. It melts at a temperature of 442°; and at a higher temperature, if air be present, it becomes converted into the dioxide, and burns with a brilliant white light. At ordinary temperatures, it is very slightly acted on by exposure to the air, or to moisture. With regard to the action of the ordinary acids of this metal, Professor Miller observes that 'nitric acid of specific gravity 1·3 acts upon it violently, and produces an insoluble hydrated binoxide, known as metastannic acid; at the same time, owing to the decomposition of water, a considerable quantity of ammonia is formed, which enters into combination with the excess of acid. Strong hydrochloric acid, when heated upon tin, dissolves it gradually, with extrication of hydrogen. Aqua regia, if not too concentrated, dissolves the metal, and converts it into bichloride. Dilute sulphuric acid is without action on the metal in the cold; but if the concentrated acid be boiled upon it, the tin becomes converted into sulphate, while sulphurous acid escapes. The hydrates of potash and soda act upon tin at high temperatures, hydrogen being evolved, whilst a soluble metastannate of the alkali is formed.' —*Inorganic Chemistry*, 2d ed., p. 588.

Tin is met with in only a few localities, and never occurs native. The metal is extracted from the ore by a series of operations described below.

There are three oxides of tin—viz., the Protoxide, or Stannous oxide (SnO), the Sesquioxide (Sn_2O_3), and the Dioxide, or Stannic oxide (SnO_2).

Protoxide of Tin, or stannous oxide (SnO), is obtained as a brown or black powder, by precipitating protochloride of tin with carbonate of sodium and heating the washed and dried precipitate in an atmosphere of hydrogen or carbonic anhydride to about 176° F. With acid it forms stannous salts, from whose solution in water crystalline tin is deposited on an inserted mass of zinc, constituting the so-called *Tin Tree.* None of these salts are of any special importance. *Dioxide of Tin*, or stannic oxide (SnO_2), occurs native in the anhydrous form, crystallising in square prisms, which are sufficiently hard to scratch glass, and generally of a brown colour, from the presence of peroxide of iron or of manganese. In its artificially prepared, hydrated condition, it has the character of an acid, and according to its different modes of preparation, forms two remarkable varieties, known as stannic and metastannic acids. *Metastannic Acid* is prepared by the action of strong nitric acid on tin, and occurs as a white, crystalline, insoluble mass, which, when dried in air, consists of $Sn_5O_{10}.5H_2O$, but when dried at 212°, loses half its water, and consists of $Sn_5H_{10}O_{15}$, or $Sn_5O_2.5H_2O$. By ignition, it becomes anhydrous, and of a pale straw colour. In this form (in which it resembles the native dioxide in its properties), it is known in commerce as *putty-powder*, and is employed for polishing plate, and for giving whiteness and opacity to enamels. In the hydrated state, it is insoluble in hydrochloric or nitric acids, but is freely soluble in solution of potash or soda, forming salts which are not crystalline, but may be obtained in a granular form. Metastannic acid, in its hydrated state, may be recognised by the beautiful golden yellow metastannate of tin which is formed when it is moistened with protochloride of tin. *Stannic Acid* ($SnO_2.H_2O$) is procured by the addition of carbonate of calcium or of barium to a solution of tetrachloride of tin, when it falls as a gelatinous precipitate. Unlike metastannic acid, it is readily soluble in nitric and hydrochloric acids; and at a temperature of 284°, it is converted into metastannic acid. In combination with the alkalies, it forms stannates, which crystallise readily, and whose formula is M_2SnO_3. The stannate of sodium (Na_2SnO_3) is largely used as a mordant by the dyer.

There are three chlorides of tin—viz., a Dichloride, or Stannous, Sesquichloride, or Stannoso-stannic, and Tetrachloride, or Stannic. *Hydrated dichloride of Tin* may be obtained by dissolving the metal in hydrochloric acid, and evaporating the solution, when the salt crystallises in prismatic needles, having the composition $SnCl_2.4H_2O$. The hydrated dichloride is extensively used as a mordant, and for deoxidising indigo and the peroxides of iron and manganese, by the dyer and calico-printer; and in consequence of its deoxidising or reducing powers, it is sometimes employed in analytical chemistry, especially in the determination of the quantity of mercury, since all the mercurial salts, when boiled with it, are decomposed, and yield their mercury in the metallic form. *Tetrachloride of Tin* ($SnCl_4$) forms numerous soluble salts with the soluble chlorides; the compound of this nature which it forms with chloride of ammonium is represented by the formula $2NH_4Cl.SnCl_4$, and is employed by the dyer under the technical term of *Pink Salt.* An impure tetrachloride prepared by dissolving tin at a gentle heat in a mixture of nitric acid and sal-ammoniac, and known in the trade as *Nitromuriate of Tin*, or *Composition*, is also largely used by dyers and calico-printers.

The sulphides of tin are three in number—viz., the protosulphide, the sesquisulphide, and the disulphide, or sulpho-stannic acid. The *Hydric Sulpho-stannate of Tin* ($HS.SnS_2$) may be obtained in the form of a dingy yellow precipitate, by passing sulphuretted hydrogen through a solution of a persalt of tin. In the dry way, it is procured in the form known as Mosaic Gold, which is insoluble in any acid, though soluble in aqua regia; and is employed in the arts to give an appearance of bronze to the surface of metals.

Tin forms two sets of salts—the protosalts or stannous and the persalts or stannic, of which the protochloride and tetrachloride of tin may be taken as good examples. The *Stannous* salts yield a very characteristic reaction with sulphuretted hydrogen, a chocolate-coloured precipitate of hydrated protosulphide of tin being thrown down; moreover, with a dilute solution of trichloride of gold, they give either a beautiful purple precipitate, known as the *Purple of Cassius*, or a brown precipitate of reduced gold, according to the quantity of the test that is used. The *Stannic* salt yields a dirty yellow precipitate of hydrated disulphide of tin; while all the compounds of tin, when exposed on charcoal to the reducing flame of the blowpipe, give a white malleable globule of the metal.

Reduction and Manufacture.—Tin must have been one of the metals earliest known, as it enters into the composition of Bronze (q. v.), of which the most ancient metallic weapons and tools were made. Tin and oysters were the products for which Great Britain was earliest famous. It is nearly all obtained in Cornwall; and from that locality the Phœnician navigators took it to Tyre and Sidon. To this day, England is by far the greatest tin-producing country, having raised in 1869 about 15,000 tons of dressed ore, or 10,000 tons of the metal. Bohemia and Saxony have some tin mines, and so also have Spain and Portugal. Tin has long been obtained from Malacca, in the Malayan Peninsula, and from some of the neighbouring islands. Australia among her other mineral riches produces tin, but the export of ore from that country has not yet exceeded 600 tons a year. Tin has recently been found in California and in Missouri, and in very minor quan-

tities elsewhere in the United States; but it is probable that Great Britain will long continue to supply the demand.

There is but one ore of tin of any importance—viz., the dioxide (SnO_2), which in its pure state consists of tin 78, and oxygen 22. It is called Tinstone or Cassiterite. Tin ore has nothing remarkable in its appearance; it is of various colours—as gray, various shades of yellow, and red, and black. Its specific gravity—a notable feature—is 6·9; and it strikes fire with steel. In Cornwall, the tin ore occurs in mineral veins running through granite and slate rocks, or disseminated in crystals through their mass. The tinstone obtained from the veins or lodes is called *Mine-tin;* and that procured by washing alluvial deposits is called *Stream-tin*—the latter is the result of the disintegration of granite and other rocks which contained veins of tin. Washed Cornish tin ore, usually called 'black tin,' produces on an average about 67 per cent. of metallic or 'white' tin. Tin pyrites, or sulphuret of tin, is found in some of the Cornish mines, but it is of little importance commercially. It may also be stated that ores containing copper are sometimes found with so large a proportion of tin that it is difficult to say whether they should be regarded as tin or copper ores.

The dressing of tin ore obtained from the mine is a difficult and delicate operation. It is so much dispersed through the gangue, that it requires to be stamped to a very fine powder by apparatus described under METALLURGY, before the metallic particles can be effectually separated. So small comparatively is the valuable portion of the ore, that at Huel Kitty Mine, St Agnes, not more than 84 lbs. of oxide of tin is obtained from a ton of the material brought to the surface; and in some mines, the proportion of oxide to the rest of the material is not so much as 10 lbs. to the ton.

The stamped ore is copiously supplied with water passed through a grating adjoining the stamps, and conveyed into a channel where there are two pits. The purer and heavier portion falls into the first, and is called the *crop;* the remainder, called the *leavings*, passes through the first, and is retained in

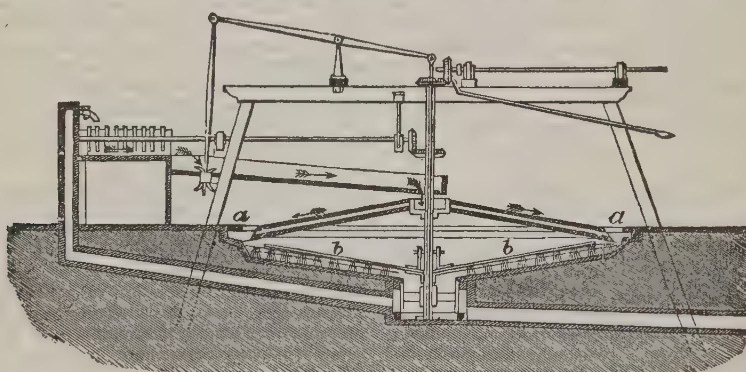


Fig. 1.

the second pit. Repeated washings are now necessary to separate as thoroughly as possible the impurities from the ore, and for this purpose a machine called a *buddle* is largely employed. Various kinds of apparatus are, however, used, but they are similar in principle to the jigging sieve and sleeping table described under METALLURGY. We may notice here that a new form of buddle, known as 'Borlase's Buddle,' has been recently introduced for dressing tin ores, by which a saving of about 30 per cent. is said to be effected. Figs. 1 and 2 shew this machine. The ore and earthy matters, in the state of a thick mud, are conveyed by square pipes or channels to the circumference *a*, *a*, around which, by the aid of water, the metallic portion separates, while the lighter stony impurities flow towards the centre, and are carried away. There are brushes at *b*, *b*, for agitating the ore during the operation. In the older form of buddle, this action is reversed, and the machine, instead of being depressed, is raised in the centre.

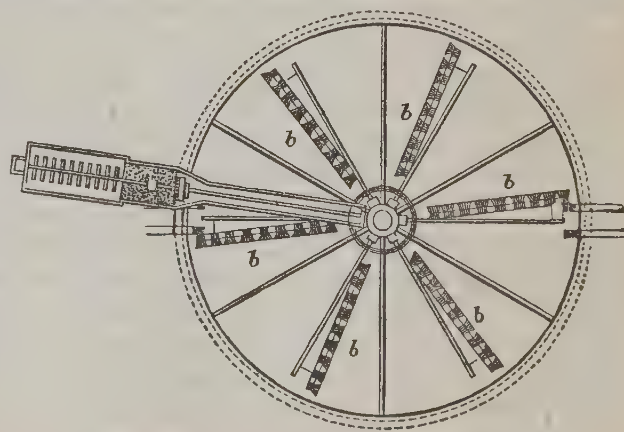


Fig. 2.

The tin ore thus far purified, has next to be deprived of its sulphur and arsenic; this is done in a Reverberatory Furnace (q. v.), the flues of which are connected with large condensing chambers, in which the arsenic is deposited in a crystalline form (see ARSENIC), and is afterwards resublimed, to form the white arsenic of commerce. The sulphur, which is present in the state of sulphuret of iron, is decomposed by the heat into sulphurous acid gas and the remaining oxide of iron is removed by a subsequent washing. Sulphuret of copper, when

present, is converted by roasting, and afterwards exposing it to the air, into sulphate of copper, and is then easily dissolved out by lixiviation.

After this final washing, the ore is ready for smelting in a reverberatory furnace. The charge consists of from 20 to 25 cwts. of ore mixed with one-sixth of its weight of powdered anthracite or charcoal, and a small quantity of lime or fluor-spar, to serve as a flux for the siliceous impurities. Before being put into the furnace, the mixture is moistened with water, to prevent the finely-powdered ore being carried away by the draught. When the charge is placed on the hearth of the furnace, the doors are closed, and the heat gradually raised for about six hours; the oxide is then reduced by the carbon of the coal. At this stage, the furnace-door is opened, and the mass worked with a paddle, to separate the slag, which is raked off, and the richer portion of it melted over again. The reduced tin subsides to the bottom, and is run off into a cast-iron pan, from which it is ladled into moulds, to produce blocks or ingots of a convenient size.

The tin has still to be purified, first by a process of *liquation*, and afterwards by that of *poling*. 'Liquation' consists in moderately heating the blocks in a reverberatory furnace till the tin, owing to its comparatively easy fusibility, melts, and flows into the refining-basin, leaving on the hearth of the furnace a residuary alloy of tin with iron and other metals. More blocks are added, and heated in the same way, till the refining-basin contains about five tons. The tin is then ready for 'poling.' In this operation, billets of green wood are plunged into the melted metal, the disengagement of gas from which produces a constant ebullition, and so causes a scum (chiefly oxide of tin) to rise to the surface, which is then easily removed; at the same time, impure and dense parts fall to the bottom. When the agitation has gone on long enough, the bath is allowed to settle and cool. The tin then separates into zones—the upper consisting of the purest portion; the middle being slightly mixed with other metals; and the lower so much so, that it requires to go through the refining process again. The residuary alloy of the liquation process has also its tin extracted and refined again.

In former times, in Cornwall, tin was smelted in a Blast Furnace (q. v.) instead of a reverberatory one; and this is still the case on the continent. By this method a pure tin is obtained, but the loss of metal in the process is greater. It suits best where coal is scarce and wood abundant.

Tin ores which contain the mineral wolfram (tungstate of iron and manganese) are treated by a special process, patented by Mr R. Oxland of Plymouth. This mineral and tin ore are so nearly the same in specific gravity, that no mechanical process of washing will separate them. Mr Oxland's process consists in roasting the dressed tin ore with sulphate of soda, for the purpose of converting the insoluble tungstate of iron and manganese into the soluble tungstate of soda, which is easily removed by lixiviation. The oxides of iron and manganese, which are left in a finely-divided state, can then, from their lower density, be readily got rid of by washing. Since the invention of this process, some of the Cornish tin ores which used to sell at the lowest, now bring the highest price. The tungstate of soda procured in the operation has lately been found to be one of the most valuable substances for rendering cotton cloths non-inflammable.

Tin when heated up to nearly its melting-point, becomes brittle, and can then be broken into prismatic fragments called *dropped* or *grain tin*. The metal which is susceptible of this change may be considered to be of fine quality, as impure tin does not become brittle when so treated. The peculiar properties of tin, especially its malleability, its brilliancy, and the slowness with which it oxidises at common temperatures in the atmosphere, render it of great service in the arts. With other metals, it forms some valuable alloys—as bronze, gun-metal, bell-metal, pewter, and solder. See ALLOY. An amalgam of tin and mercury forms the metallic coating of mirrors. Tin is very largely used to coat the surface of other metals, as iron and copper. See TIN-PLATE. The applications of tinfoil, which is not more than $\frac{1}{1000}$th of an inch in thickness, are well known. In certain kinds of ornamental metal-work made in India, tin is applied instead of silver for ornamenting steel and iron. A compound of tin with gold, and also with other metals, is employed to produce crimson, purple, and pink colours on glass and pottery. Metastannic acid (see above) is used in the preparation of enamels; and under the name of *putty-powder*, is largely used for polishing plate and ornamental stones. The two chlorides of tin are prepared on a large scale for dyers and calico-printers.

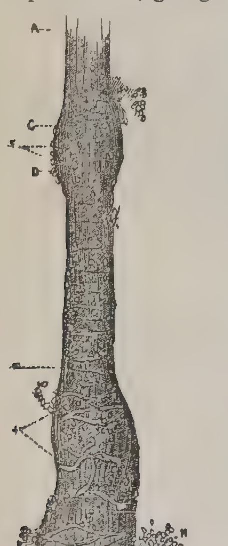
TINCAL. See BORAX.

TINCTURE. See HERALDRY.

TINCTURES are defined by Dr Christison to be 'solutions of vegetable and animal drugs, and sometimes of mineral substances in spirituous liquids. The spirit most commonly employed is proof-spirit; sometimes rectified spirit is used; and occasionally ether. Ammonia is sometimes conjoined with the spirit, in which case the solution is termed an ammoniated tincture. (It may be as well to remind the reader that *Rectified Spirit* is alcohol with 16 per cent. of water, and that its specific gravity is ·838; and that *Proof Spirit* is composed of 5 parts of rectified spirit mixed with 3 parts of water, the resulting compound containing about 47·5 per cent. of water, and having a specific gravity of ·920.) The choice between proof and rectified spirit depends on their respective solvent powers over the active principles of the drugs employed. The ether and ammonia are principally used for their antispasmodic properties. 'The form of tincture,' says Dr Christison, 'is one of the best in pharmacy; for the menstruum is a powerful solvent of the active constituents of drugs; it presents them in small volume; it preserves them very long unaltered, and it is for the most part a convenient medium for uniting them with other substances in extempore prescriptions.'

TINDAL, DR MATTHEW, a notable deistical writer, was the son of a clergyman at Beer-ferris, in Devonshire, where he was born about 1657. He was educated at Lincoln and Exeter Colleges, Oxford; took the degree of B.A. in 1676; and shortly after, was elected Fellow of All Souls' College. In 1685, he became a Doctor of Law; and after a brief lapse into Romanism during the reign of James II., reverted to Protestantism, or rather, as events shewed, into Rationalism. His first work was entitled *An Essay concerning Obedience to the Supreme Powers*, &c. (Lond. 1693); followed in the course of a few months by *An Essay concerning the Laws of Nations and the Rights of Sovereigns*; but it was not till 1706 that he attracted any particular notice, when the publication of his treatise on *The Rights of the Christian Church asserted against the Romish and all other Priests who claim an independent power over it; with a Preface concerning the Government of the Church of England, as by Law established*, raised a storm of opposition, that may perhaps be considered to have fulfilled the prediction of the author, who told a friend that 'he was writing a book which would make the clergy mad.' A

perfect torrent of replies and refutations poured from the press. Among those who signalised themselves as the adversaries of T., the least obscure were Dr G. Hickes and Conyers Place. Swift, it may be noticed in passing, also indulged in some 'Remarks.' On the continent, T.'s work was quite differently received. Le Clerc, in his *Bibliothèque Choisie*, praises it very highly, as one of the solidest defences of Protestantism ever written. In 1730, when he had nearly reached the age of 73, he published his most celebrated treatise, entitled *Christianity as old as the Creation, or the Gospel a Republication of the Religion of Nature*, which effectually settled the question of his religious creed. The design of the work is to strip religion 'of the additions which policy, mistake, and the circumstances of the time have made to it'—in other words, to eliminate the *miraculous* element, and to prove that its morality, which is admitted to be worthy of an 'infinitely wise and good God,' is its true and only claim to the reverence of mankind. T.'s purpose was rather constructive than destructive; and it was on this account that he called himself a 'Christian Deist.' He was answered, among others, by Dr Waterland, Mr Foster (an eminent dissenting minister), Dr Conybeare (afterwards Bishop of Bristol), and Dr Leland (q. v.), with various degrees of ability and success. T.'s book is written in excellent English, and is unquestionably a very able performance, giving its author a distinguished place among the 18th c. deists. T. died 16th August 1733.



Fungus in *Tinea decalvans*: AF, lower part of an affected hair, highly magnified; FG, its root; C, spheroidal swelling due to accumulation of spores, E, between the longitudinal fibres of the hair; D, rupture of long fibres; I, sporules and tubes of the parasite; H, a group of sporules proceeding from G, the ruptured root.

(From Aitken's *Science and Practice of Medicine.*)

TINDER, an inflammable material, usually made of half-burned linen. It was formerly one of the chief means of procuring fire before the introduction of chemical matches. The tinder was made to catch the sparks caused by striking a piece of steel with a flint; and the ignited tinder enabled the operator to light a match dipped in sulphur. This intermediate step was necessary in consequence of the impossibility of making the tinder flame. Partially decayed wood, especially that of willows and other similar trees, also affords tinder; and certain fungi furnish the German tinder, or Amadou (q. v.).

TINEA is a term somewhat vaguely employed to designate certain parasitic diseases of the skin, and especially of the scalp. Three of the most important varieties of tinea, viz., *T. circinatus* (ringworm of the body), *T. tonsurans* (ringworm of the scalp), and *T. sycosis* (ringworm of the beard), have been already described in the article RINGWORM (q. v.). In these three varieties, which are included in the general term *T. tondens*, the vegetable parasite known as *Trichophyton tonsurans*, figured in the above article, is always present. It now remains to notice the *Tinea decalvans* of Bateman, known also as *Porrigo decalvans*, *Alopecia circumscripta*, &c. It is defined by Aitken as 'a fungus disease, causing the formation of rounded or oval patches of baldness, sometimes solitary, more generally multiple. It affects the hairy scalp principally; but the beard and hairy portion of the skin may also suffer.'—*The Science and Practice of Medicine*, 2d ed., vol. i. p. 925. The fungus which causes these patches of baldness was detected by Gruby in 1843, and named the *Microsporon Audonini*. It differs from the *Trichophyton* by its numerous waved filaments, and the extremely small size of its sporules, and likewise by its position, not being found in the interior of the root of the hair, but forming a little tube round each hair, and thus causing it to soften and break down. The hairs thus affected become dull and partially loose; the skin in which they are implanted becomes red, swollen, and slightly itchy; and a whitish matter (the sporules of the fungus) may soon be observed on the diseased skin and hairs. The hairs then suddenly fall off from the affected part, leaving a round bald patch of a very white colour. The disease is capable of transmission from one person to another, although less readily than *Tinea tonsurans*. It chiefly affects children. The treatment consists in preventing the spread of the disease by extracting the hairs round the circumference of the patch, and washing the head daily with soft soap; and all the young hairs within the patch must be extracted till a healthy crop begins to appear. Moreover, a solution of sulphurous acid, as recommended for ringworm, should be applied. When by these means the fungus has been destroyed, stimulants must be applied to the bald patches. A mixture of equal parts of *Collodium* and of *Ether cantharidalis* (*Collodium vesicans*) is, according to Dr Aitken, the most useful stimulant in these cases.

TINEI'DÆ, a family of small moths, the smallest insects of the lepidopterous order. The body is long and slender, the wings entire, often narrow, mostly convoluted in repose. Many of them are very brilliantly coloured, exhibiting beautiful little stripes and patches of gold and silver. Many deposit their eggs in animal substances, on which the larvæ feed, making cases for themselves out of the substance they feed on. The Clothes Moths (q. v.) are a familiar example.

TI'NGI (*Magonia glabrata*), a tree of the natural order *Sapindaceæ*, which covers large tracts of country in some parts of Brazil, to the exclusion of almost everything else, generally growing to the height of 30 or 40 feet, but sometimes much higher. An infusion of the bark of the roots is used to poison fish. The fruit is a large dry triangular capsule, filled with broad flat seeds, from which a kind of soap is made. The membrane which covers the cotyledons is stripped off, and they are steeped in water till they begin to swell and soften, and boiled with a little tallow. A homogeneous mass is formed, which is used for washing clothes.

TI'NKER'S ROOT (*Triosteum perfoliatum*), a shrubby plant of the natural order *Caprifoliaceæ*, a native of North America, the root of which is used as an emetic and mild cathartic. It derives its name from Dr Tinker, who first brought it into notice.

TI'NNITUS AU'RIUM is the Latin translation of, and ordinary medical term for, ringing in the ears. In most cases, it is an unimportant symptom, depending on some local temporary affection of the

ear, or on some disturbance of the digestive system with which the part of the brain, from which the auditory nerve springs, sympathises, or which excites the cerebral circulation (as often occurs in the morning after too liberal evening potations); but as it is also a common symptom of organic disease of the auditory nerve, it may indicate a dangerous condition, or may be a prelude to complete deafness. Hence, although commonly of no consequence, it is a symptom that, especially if permanent, must be carefully watched. It may be readily induced for a few hours by a large dose of quinia.

TI'NOS, or TINO (anc. *Tenos*), an island in the Grecian Archipelago, belonging to the group of the Cyclades, lies immediately south-east of the island of Andros, 53 miles off the coast of Bœotia. It is 18 miles long, 8 miles in extreme breadth, has an area of 81 sq. m., and a pop. of 21,171. The Tenians were conspicuous among the ancient Greeks for their industry, and they still maintain their preeminence in that respect. The island is carefully cultivated, well watered, has a delightful climate, and is very productive in silk, wine, barley, and fruits. Silk gloves and stockings are manufactured; and the inhabitants have made themselves famous as workers in marble, which is found in the island. In the modern town of Tenos, or St Nicholas, is a cathedral built of white marble, and famous as a resort for pilgrims.

TIN-PLATE. The manufacture of this article forms a branch of the iron trade. The art of tinning plate-iron is said to have been invented in Bohemia, about the beginning of the 16th c., although the tinning of copper was known some time earlier. Tin-plate was first made in England about the year 1670.

Sheet-iron for tin-plates is made either of charcoal-bar or coke-bar, which has been rolled with particular care, in order to avoid scales on the surface. Before tinning, the plates are called 'black plates.' When the iron has been cut to the required size, the plates are 'pickled'—that is, they are immersed in hot sulphuric or hydrochloric acid which has been diluted by 16 parts of water to 1 of acid, the use of the acid being to remove all oxide and other injurious matter. After this, the plates require to be washed several times in water; and then follows an annealing in closed cast-iron boxes in a reverberatory furnace, where they are subjected to as high a heat as they will stand without softening. The next operation consists in passing the plates two or three times through chilled iron rollers highly polished with emery and oil, so as to give them a well-polished surface. This both saves tin and gives them a good appearance when finished. Once more they are sent to the annealing furnace, passed again through dilute sulphuric acid, which is followed by another washing, but this time in running water, and then scoured with sand. This should leave them quite clean and bright for the tinman.

Each plate is now put singly into a pot of melted grease (which has become sticky by use), and left till it is completely coated, after which the plates are taken in parcels and plunged into a bath of melted tin covered with grease, called the 'tin-pot.' They pass from this to another vessel with two compartments called the 'wash-pot,' both of which contain melted tin of the purest quality, and like the last, covered with grease. The plates are put into the first compartment in parcels, where they receive a coating of purer tin than that of the 'tin-pot,' and are then withdrawn one by one, and wiped on both sides with a hemp brush; the marks of which are obliterated by another dipping in the second compartment of the 'wash-pot.' This last dipping also gives the plates a polish. The next thing is the removal of the superfluous tin, which is generally two or three times more than what is left on the plate. It is done by immersing the plates, in an upright position, in a pot containing tallow and palm oil, maintained at a temperature no higher than will keep the tin in contact with the oil liquid, and so allow it to run off. The final treatment consists in working the plates separately in troughs of bran with a little meal, and then rubbing them with flannel.

There is a variety of tin-plates called 'terne-plates,' coated with an alloy of tin and lead, in which the proportions vary from 1 of lead and 2 of tin to 2 of lead and 1 of tin. They are largely exported to Canada, where they are used for roofing.

The imports of tin and its manufactures entering into consumption in the United States in 1870 amounted to $9,721,000.

TI'NSEL OF THE FEU, in the Law of Scotland, means an irritancy or forfeiture of a feu-right caused by the failure to pay the feu-duty for two whole years. A statute of 1597 authorised, in such a case, the superior to take steps to obtain a decree of declarator that the feu was forfeited; but the vassal might, any time before decree, purge the irritancy by paying the arrear.—TINSEL OF THE SUPERIORITY is a similar remedy which a vassal has against the superior who has not got himself infeft, so as to be in a position to complete the vassal's title. In such a case, the tenant may under the statute 1474 charge the superior, that if he do not within forty days obtain infeftment, he shall lose the tenant or vassal for his (the superior's) lifetime, and thereby all the casualties that may fall to the superior from the act or delinquency of such vassal.

TI'NTERN ABBEY, a famous ecclesiastical ruin on the right bank of the Wye, in Monmouthshire, about 9 miles south-south-east of Monmouth. The Abbey—properly so called—was founded in 1131 for Cistercian monks, by Walter de Clare, and dedicated to St Mary; but already in the previous century a church had been built, and in 1268, mass was celebrated by abbot and monks for the first time. The style of architecture is a transition from Early English to Decorated, and is very fine. Most of the building, except the roof and tower, remains. T. A. owes not a little of its celebrity to Wordsworth's poem, entitled *Lines composed a few Miles above Tintern Abbey, on revisiting the Banks of the Wye*—though in reality the poem has nothing whatever to do with the Abbey, which is not once mentioned or alluded to in it.

TINTORETTO, a Venetian historical painter, so called from the fact of his father being a dyer (*Tintore*), but whose real name was JACOPO ROBUSTI, was born in 1512. He studied for a short time under Titian, but appears to have been for the most part self-taught. His motto was a very fine one: *Il disegno di Michael Angelo, e 'l colorito di Tiziano* (The design of Michael Angelo, and the colouring of Titian); but it cannot be said that he adhered to it, and he is certainly a long way inferior to either artist. Still, his assiduity, when young, in acquiring a varied knowledge of the human figure under all possible aspects of light and shade, commands respect, in spite of the theatrical means to which he often resorted; and the rapidity of his pencil (which got him the name of *Il Furioso*) is at least astonishing. Sebastian del Piombo remarked that T. could paint as much in two days as he could do in two years. A catalogue of T.'s works, specimens of which are to be found in almost

all galleries, is impossible within our limits. We can only mention a few of the more famous, as 'Belshazzar's Feast, and the Writing upon the Wall' (fresco, for the Arsenal at Venice), 'The Tiburtine Sibyl,' 'The Last Supper and the Washing of the Disciples' Feet,' 'A Crucifixion,' 'The Worship of the Golden Calf,' 'The Last Judgment' (the last two immense pictures 50 feet high, and very splendid in conception), 'St Agnes restoring to Life the Son of a Prefect,' 'The Miracle of St Mark,' a 'Resurrection of Christ,' 'The Slaughter of the Innocents,' and a grand picture of 'Paradise'—34 feet high by 74 long, with upwards of 100 figures. Some of T.'s earlier pictures are very carefully finished, but his later ones are dashed off with a fatal haste, that justifies the remark of Annibal Caracci, that if he 'was sometimes equal to Titian, he was often inferior to Tintoretto.' T. lavishly indulged in *chiar' oscuro*, but his colouring is not gay or brilliant; it is rather cold and leaden, as might be expected of a painter who, when asked what were the prettiest colours, replied: 'Black and white.'

TIPPECANOE′, a river of Indiana, U. S., which rises in a lake of the same name in the northern part of the state, flows south-west 200 miles, and empties into the Wabash 9 miles above Lafayette. It is famous for the battle fought on its banks, November 5, 1811, in which the Indians, under Tecumseh's brother, the prophet, were defeated by General Harrison.

TIPPERA′RY, an inland county of the province of Munster, Ireland, bounded on the S. by Waterford; and on the W. by Cork, Limerick, Clare, and Galway. Area, 1659 sq. m., or 1,061,731 acres, of which 843,837 are arable, 178,183 uncultivated, 2359 in towns, and the rest under plantations and water; pop. in 1871, 216,210, of whom 202,798 were Catholics, 13,412 Protestants, including Presbyterians and other sects of Christians. The population in 1881 was 199,612. In the year 1872, the number of acres under crops of different kinds was 280,082. In the same year the cattle numbered 228,760; sheep, 263,081; and pigs, 97,264. The inhabitants are mostly engaged in agriculture. The total value of property is £675,587. The number of children attending schools in the county of T. in 1871 was 41,802, of whom 40,598 were Roman Catholics, 1066 of the Established Church, and the rest of other denominations.

The county of T. for the most part lies in the basin of the river Suir. This river rises near Templemore, in the north of the county; and after traversing T. a distance of about 76 miles, forms for a time its boundary with Waterford, through which county it ultimately passes to the sea. The other rivers of T. are the Nore, the Nenagh, and the Brosna. The lakes are numerous, but of small size. The county is intersected by the Great Southern and Western, and the Limerick and Waterford Railways. The surface is generally plain, and the mountains which diversify it are rather groups than portions of any connected range. These mountains are the Galtees, rising to 3000 feet, Knockmeledown (2700 feet high), and Slievenaman on the south; Keeper Mountain, 2100 feet high, and its group on the west; and the Slievardagh Hills on the east. There is one very curious isolated height called the Devil's Bit, to which many popular legends attach. The soil of the plain is a rich calcareous loam, singularly fertile and productive, especially a district called the Golden Vein, in the centre of which stands the town of Tipperary (q. v.), and which extends from Limerick to the county of Kilkenny. There is another similarly fertile district in the north of the county. In geological formation the plain belongs to the great central limestone district. The mountains are for the most part of clay-slate, surrounded or surmounted by sandstone; the Galtees, together with a contiguous group called Slievenamuck, as well as the intervening valley, being sandstone. There is a large amount of bog in the central and eastern districts, one continuous tract extending a distance of thirty miles. The mineral productions are coal (anthracite), copper, and lead, also zinc and very good fire-clay; and slates of an excellent quality are quarried near Killaloe. Wheat was formerly grown in large quantities; but of late years dairy-farming and the raising of cattle have been rapidly taking the place of the production of cereals. Flax is but sparingly produced.

The county, which sends two members to the House of Commons, is divided into two ridings, North and South, each of which is subdivided into six baronies.

Anciently, T. formed part of the two distinct principalities of Ormond, or North Munster, and Desmond, or South Munster: after the English invasion, T. was formed into a county by King John in 1210; but the authority of the conquerors was long little more than nominal. Eventually, it came to be divided between the Anglo-Norman families of Butler, which held Ormond, and Geraldine, to whom a portion of Desmond fell. The antiquities are numerous, as well Celtic as Anglo-Norman. In the latter, the city of Cashel is specially rich; and the ruin of Holy Cross is a noble specimen of the monastic remains of the medieval period, as the castle of Cahir is of the military and baronial architecture of the same age. There is a series of caves near the border of the county of Cork, in the vicinity of Mitchellstown, which attract much notice as a natural curiosity. They consist of a number of chambers and galleries formed by stalactite deposits, one portion of the range being no less than 870 feet in length.

TIPPERARY, a market-town of the county of the same name, on the river Arra, 111 miles south-west from Dublin by the mail-coach road, and 110 by the Great Southern and Western Railway, with which it is connected by the Limerick and Waterford Railway. T. occupies a central position in a fine county, and carries on, therefore, an extensive trade in butter. The pop. in 1871 was 6084; town-rates levied £120. The town is of very ancient foundation, and soon after the invasion was occupied as a strong place by the English, who built a castle in it during the Irish expedition of King John. This castle, however, fell soon afterwards into the hands of the Irish under the Prince of Thomond. The town is well built, but of no architectural pretensions, and contains a large and handsome Roman Catholic church, a Protestant church, a Presbyterian meeting-house, two National Schools, and one school of the Erasmus Smith endowment.

TIPPOO SAHIB, sultan of Mysore, and son of Hyder Ali (q. v.), was born in 1749. Efforts were made to carefully instruct him in the various branches of learning cultivated by Mohammedans; but T. much preferred the practice of athletic exercises, and the companionship of the French officers in his father's service, from whom he acquired a considerable acquaintance with European military tactics. This knowledge he put to effective use during his father's various wars, by completely routing Colonel Bailey at Perimbakum (10th September 1780), and (18th February 1782) Colonel Braithwaite on the banks of the Kolerun in Tanjore, though these were his only important engagements with the British

forces in which he could boast of success. On the death of his father, he was crowned with little ceremony, returning at once to the head of his army, which was then engaged with the British near Arcot. On 28th April 1783, he captured and put to death most of the garrison of Bednore; but news of the peace between France and England having reached his French allies, they retired from active service, and T. ultimately agreed to a treaty (11th March 1784), stipulating for the *status quo* before the war. During the continuance of this peace, he occupied himself in regulating the internal administration of Mysore, sent ambassadors in 1787 to France to stir up a war with Britain, and failing in this, at length so far allowed his inveterate hatred of the English to overcome his judgment, as to invade (April 1790) the protected state of Travancore. In the ensuing war (1790—1792), the British, under Colonel Stuart and Lord Cornwallis, were aided by the Mahrattas and the Nizam, who detested their powerful and aggressive neighbour equally from fear and religious hatred (T. being a fanatical Mohammedan); and though the tactics of the sultan in laying waste the Carnatic almost to the very gates of Madras, baffled his opponents for a time, he was ultimately compelled (16th March 1792) to resign one half of his dominions, pay an indemnity of 3030 lacs of rupees, restore all prisoners, and give his two sons as hostages for his fidelity. Nevertheless, his secret intrigues in India against the British were almost immediately resumed; another embassy was sent to the French; and the invasion of Egypt by the latter in 1798, and T.'s machinations, having become known to the governor-general almost contemporaneously, it was resolved to punish the perfidious sultan. Hostilities commenced in March 1799; and two months after, T. was driven from the open field, attacked in his capital of Seringapatam, and after a gallant resistance, slain. He was buried in his father's mausoleum, 5th May 1799, during a storm of thunder and lightning, which caused the death of several Europeans and natives. His government of Mysore after 1792 was of a most oppressive character, yet T. was extremely popular, and after his death was esteemed by the Mohammedans as a martyr to the faith of Islam. Of the chief articles of *virtù* with which his palace abounded, many are now in Fife House, Whitehall (having been lately removed thither from the East India House in Leadenhall Street), as also the half of his library, the other half being preserved at Fort-William, Bombay.

TI'PULA AND TIPU'LIDÆ. See CRANE-FLY.

TIRABOSCHI, GIROLAMO, an eminent Italian author, was born at Bergamo, 28th December 1731, studied at Monza, and afterwards entered the order of the Jesuits. Towards 1766, he was appointed Professor of Rhetoric at Milan, where he wrote his first work, *Vetera Humiliatorum Monumenta* (1766); and in 1770 succeeded Father Granelli in the post of librarian to the Duke of Modena. T. now availed himself of the rich stores of the ducal library, besides making extensive researches in other archives, to compose his *Storia della Letteratura Italiana* (History of Italian Literature), which began to appear in 1772, and was finished in 1783 in 13 vols. It embraces the history both of ancient and modern Italy, and is especially valuable for the light which it throws upon the intellectual condition of the Peninsular during the dark ages, and the brilliant period from Dante to Tasso. T. ends his elaborate survey with the close of the 17th century. It is impossible to praise too highly the learning and the conscientious accuracy of the author, even although the circumstances that many of the epochs have since been made the subject of minute and special inquiries, necessitates a revision of parts of the work. A second edition was edited by T. (1787—1794), and abridged translations have appeared in French and German. The best edition is that published at Milan (16 vols. 1822—1826). A continuation embracing the literature of the 18th c. was written by Lombardi (*Storia della Letteratura Italiana nel Secolo XVIII.*). T. died at Modena, June 3, 1794. Other works by this author are *Biblioteca Modenese* (6 vols., Mod. 1781—1786); and *Memorie Storiche Modenesi* (3 vols., Mod. 1793).

TIREE', one of the Inner Hebrides, included in Argyleshire, lies 20 miles north-west of Iona. It is 13 miles long, and over 6 miles in extreme breadth. The surface is low, rising in the north to little more than 20 feet, and in the south to about 400 feet above sea-level. The absence of trees and shrubs gives to the island a bleak appearance. There are numerous small lakes. Upwards of 5000 acres are under tillage, while 10,700 acres are in pasture or waste-land. Some interest attaches to the island from the number of Scandinavian forts which dot the shores, and from the standing-stones, ruined churches, and ancient graves which occur in the interior. Pop. (1871) 2834, who support themselves by rearing cattle, fishing, and exporting poultry and eggs.

TIRE'SIAS, in Greek Mythology, figures as a famous prophet, who, according to one legend, was struck blind by the goddess Athena, because he had seen her bathing. Another legend represents Hera as depriving him of his sight because, being made arbiter in a dispute between her and Zeus, he had decided in favour of the latter; when Zeus as a compensation granted him the inner vision of prophecy, and prolonged his life for several generations. He is consequently prominent in many of the mythical stories of Greece, but at last found death by drinking from the well of Tilphosa. Even in Hades, T. retained his prophetic power.

TIRLEMONT (Flemish, *Thienen*), a town of Belgium, in South Brabant, on the Great Geete, 38 miles east-south-east of Brussels, on the Brussels and Cologne Railway. The church of St Germain, on an eminence, dates apparently from the 9th c., and contains an altar-piece by Wappers. Beer and hosiery are manufactured. T. was ravaged by Marlborough in 1705; and here the French, under Dumouriez, defeated the Austrians in 1793. Pop. about 12,500.

TI'RNOVA, a town of European Turkey, in Bulgaria, on the Jantra, 35 miles south-south-east of Sistova. It was formerly the chief town of Bulgaria, and the seat of considerable manufactures, and whatever rank it now holds it owes to its central position. There are numerous mosques, churches, and synagogues; dyeing is carried on, and silk and coarse cloth are manufactured. Pop. variously stated at from 12,000 to 16,000.

TI'RYNS, an ancient city of Argolis, in the Peloponnesus, one of the very oldest cities of Greece, situated a short distance south-east of Argos, near the head of the Argolic Gulf. According to the common tradition, it was founded by Prœtus, a mythic king of Argolis; and its massive walls, like other rude massive structures in Greece of unknown antiquity, were reputed to be the work of the Cyclopes. Prœtus is said to have been succeeded by Perseus; and in this place Hercules was believed to have passed his youth. At the time of the Trojan War, T. appears to have been subject to the kings of Argos. Some time subsequently to the battle of Platæa (to which the Tiryntians sent troops), probably about the year 468 B. C., the city

was taken by the Argives, and entirely destroyed; and after this period, T. remained uninhabited, the walls of the citadel only being left standing, the wonder and admiration of later ages. T. affords one of the most interesting specimens of what is called Cyclopean architecture, the ruins of this place, and those of the neighbouring city of Mycenæ, being the grandest of all in Greece. The Acropolis, or citadel of T., was built on the summit of a low, flat, rocky hill, rising abruptly out of the dead level of the plain of Argos, and appears to have consisted of an upper and a lower enclosure of nearly equal size, with an intermediate platform. There were two main entrances, on the east and on the south sides, with a postern on the west. The entire circuit of the walls still remains more or less preserved; they are upwards of 20 feet in thickness, and are formed of unhewn stones of enormous size, rudely piled in tiers one above the other, without the use of mortar or cement, the interstices being filled up with smaller stones, so as to make the whole mass solid and compact. There are several covered galleries of singular construction in the body of the wall, on the east and the south sides, the roof being formed by sloping the courses of masonry on each side of the passage at an angle to each other. One of them has six recesses, or niches, on the outer side of the walls, intended probably to facilitate defence. Altogether, in the words of Colonel Mure, 'this colossal fortress is the greatest curiosity of the kind in existence.'

TI'SANE, TISAN, or PTISAN, an infusion made of certain herbs, leaves, or flowers, used as tea for medicinal purposes. It is a very favourite form of remedy in the domestic medicine of France.

TISSUES, Animal, may be either normal or pathological. The most important of these tissues have already been considered in special articles, and we shall here merely notice the view at present most generally adopted regarding their classification (see Histology). The normal tissues are divisible, according to Virchow and his followers, into three groups or categories. We have (1) tissues which consist exclusively of cells, when cell lies close to cell; or (2) tissues in which one cell is regularly separated from the others by a certain amount of intermediate matter, or intercellular substance; or (3) tissues in which the cells have attained specific, higher forms of development, by means of which their constitution has acquired an entirely peculiar type. As illustrations of the first group of tissues, the simple cellular tissues in the modern sense (cellular tissue here being quite distinct from areolar or connective tissue), we may take the epithelial formation, such as occur in the epidermis and the nails, and in the epithelium of mucous and serous membranes, in the crystalline lens of the eyes (which is originally a mere accumulation of epidermis), and in the glands. The second group is formed by the connective tissue, which is composed of intercellular substance, with cells of various forms embedded in it, and includes cartilage, fatty tissue, &c. In the third group, which is somewhat heterogeneous, the structures are usually more or less tubular. This group includes the muscles, nerves, and vessels, and Virchow also places the blood in it. Such an arrangement as this is quite distinct from, and altogether at variance with, those adopted a comparatively few years ago. *This* arrangement has reference to General Histology (*tissues*, properly so called), while *that* has reference to Special Histology, or the structure of organs in which a combination of various tissues may enter. Thus, the *osseous tissue* of general histology consists of bone-cells + calcified intercellular substance, while *bone as an organ* consists of osseous tissue + medullary tissue + periosteum + vessels + nerves; similarly, nervous tissue is by no means identical with cerebral matter, which additionally contains membranes, vessels, &c.

Morbid tissues may be classified upon exactly the same plan as the physiological or normal tissues. The belief is gradually extending that there is nothing peculiar or specific in pathological structures, or, in other words, that every pathological tissue has its physiological prototype, and that 'no form of morbid growth arises which cannot in its elements be traced back to some model, which had previously maintained an independent existence in the economy.'—Virchow's *Cellular Pathology*, translated by Chance, p. 60. The distinguished pathologist whose words we have just quoted, maintains that there is no other kind of heterology in morbid structures than the abnormal manner in which they arise, and that this abnormity consists either in the production of a structure at a point where it has no business, or at a time when it ought not to be produced, or to an extent which is at variance with the typical formation of the body; 'but,' he adds, 'practical experience shews us that it would be altogether incorrect to conclude from the mere correspondence of a pathological tissue with a physiological one, that the case would continue to follow a benignant course.' The curious bodies provided with large nuclei and nucleoli, which have been described by many pathologists as 'the specific polymorphous cells of cancer,' are merely irregularly developed epithelial cells, such as occur, for example, in the lining of the urinary passages; and the apparent heterology of other morbid growths may be similarly explained.

TISSUES, Vegetable. See Cellular Tissue, Vascular Tissue, and Vegetable Tissues.

TIT, or TITMOUSE (*Parus*), a genus of birds of the order *Insessores*, tribe *Conirostres*, and family *Paridæ*. The *Paridæ* are small birds, of which there are more than 50 known species, widely distributed throughout Europe, Asia, Africa, and North America. They are more numerous in cold and temperate than in tropical regions, those which are found within the tropics being mostly inhabitants of elevated mountainous districts. The bill is small, short, somewhat conical, the tip entire, the base beset with hairs, and the nostrils generally concealed by feathers. The wings are not very long, but are pointed; the tail is rounded or even; the tarsi long, slender, scaled in front, the inner toe shortest, the claws long and curved. The plumage is beautiful, often gay. The popular names Tit and Titmouse are very generally given to all the *Paridæ*. They are bold sprightly birds, extremely active, flitting from branch to branch, running rapidly along branches in quest of insects, and often clinging to the under-side of branches with their back downwards. They feed not only on insects but on grain and seeds, have no objection to carrion, and sometimes kill young and sickly birds by strokes of their bill. They are very pugnacious, and the female Tit shews great courage in defence of her nest, often continuing to sit when the nest is approached, and vigorously assailing the intruding hand with her bill. In winter, many of the species gather into small flocks, and approach houses and villages, competing with sparrows and chaffinches for a share of the food of domestic poultry. Most of the tits lay at least six eggs, some of them twelve or more, and even in temperate countries they often produce two broods in a year. They generally build in trees. The young are fed chiefly on caterpillars. A pair of Blue Tits have been observed to carry a caterpillar to their nest, on an average, every two minutes

during the day, so that these birds must be extremely useful in preventing the multiplication of noxious insects. Seven species are found in Britain, but one of them, the CRESTED TIT (*Parus cristatus*) is a mere accidental visitor. The GREAT TIT (*P. major*) is the largest European species. It is common in almost all parts of Europe. It is not quite six

Cole Tit (*Parus ater*), and Long-tailed Titmouse (*Parus caudatus*).

inches long; the head and throat are black; the cheeks are white; the back, breast, and sides yellowish; the wings and tail grayish. Its usual note is a kind of chatter, but it sometimes imitates the notes of other birds. The BLUE TIT (*P. cœruleus*) and the COLE TIT (*P. ater*) are very common in Britain. The Blue Tit is perhaps the most pert and audacious of all the British species. It very generally receives the familiar name of *Tomtit*. The upper part of the head is light blue, and a bluish tinge prevails in the plumage. The LONG-TAILED TIT (*Parus caudatus*), common in Britain, has the tail about as long as the body. Its head is white, contrasting beautifully with the deep black of the back; the tail is also black, with white edges. The nest of this bird is a beautiful structure of moss and wool externally covered with lichens, and profusely lined with feathers, nearly oval, with a small hole in the upper part of one side. Still more interesting is the nest of the PENDULINE TIT (*Aegithalus pendulinus*) of the south of Europe, which in form resembles a flask, and is generally suspended at the end of a flexible twig, in a situation near to or overhanging water. It is nicely woven of fibres of bark and the down of willow or poplar catkins, and the opening is in the side. The CHICKADEE or BLACK-CAP TIT (*Parus atricapillus*) is very common in North America. The TUFTED TIT (*Lophophanes bicolor*) is the largest American species.

TITA'NIUM (symb. Ti, equiv. 50, spec. grav. undetermined) is a comparatively rare metal, which, according to the method by which it is procured, occurs either as a gray, heavy, iron-like powder, which burns with brilliant scintillations in the air, and is converted into titanic acid, or in prismatic crystals. At 212° it decomposes water, and it is soluble in hydrochloric acid. It is obtained in the crystalline form by heating sodium in the vapour of bichloride of titanium. It never occurs native, but is found in association with other elements in various minerals, of which the most important are *Anastase*, *Rutile*, and *Brookite*, containing titanic acid; *Titanite*, containing silicate of lime and titanic acid; *Perovskite*, containing titanite of lime; *Æschynite*, containing titanic and niobic acids, and the oxides of cerium and lanthanum; and lastly, *Titanic Iron*, composed of titanate of protoxide of iron. A remarkable artificial compound of the metal is often found in the form of copper-coloured cubic crystals, adhering to the slags of iron furnaces. They are hard enough to scratch agate; and no acid except a mixture of nitric and hydrofluoric acids has any action on them; but they are volatile at an extremely high temperature. They consist of a combination of cyanide with nitride of titanium, and are represented by the remarkable formula, $TiCy_2.3Ti_3N_2$. The most important compound of this metal is *Titanic Acid* ($H_2.TiO_3$), which occurs in the minerals *Menaccanite* and *Iserine*, as titanate of iron, but is more common in the uncombined state, as titanic anhydride, in the form of rutile, brookite, and anastase, each of which possesses a distinct crystalline form, and has a different specific gravity. Hence, titanic acid in the anhydrous state is trimorphous. It is usually obtained by a somewhat complicated process from rutile. Titanium was discovered by Gregor, as a constituent of menaccanite, in 1791.

TI'TANS AND TITA'NIDÆ (originally called *Ouraniōnes*, Celestials), in Greek Mythology, were the sons and daughters of Uranus (Heaven) and Gæa (Earth). Their names, as commonly given, were: Oceanus, Cœus, Crius, Hyperion, Iapetus, Kronos, Theia, Rhea, Themis, Mnemosyne, Phœbe, and Tethys; Dione, Phorcys, and Demeter are added by some writers. Instigated by their mother, the T., headed by Kronos, rose against their father, emasculated and deposed him, and liberated their brothers the Hecatoncheires (Hundred-handed) and the Cyclopes (q. v.), from Tartarus. Kronos being made king, threw the Cyclopes back again to Tartarus, and married his sister Rhea. In order to escape being deposed by one of his own children, as it was foretold he would be, Kronos swallowed each as it was born. Rhea, when she gave birth to Zeus (q. v.), saved his life by giving a stone wrapped in a cloth to Kronos, who swallowed it, believing it to be his child. Zeus, when he grew up, gave his father a potion which caused him to vomit the stone and the children he had swallowed. Assisted by his brothers and sisters, along with the Cyclopes and Hecatoncheires, Zeus began with the T. the ten years' conflict which resulted in the complete triumph of the former, and the overthrow of the latter, who were hurled down into a dungeon below Tartarus, surrounded by a brazen wall, and guarded by the Hecatoncheires. During the war, Zeus and his allies occupied Mount Olympus in Thessaly, his opponents being encamped on Mount Othrys.—The name T. is also given to the descendants of the T., such as Prometheus, Hecate, Helios, Selene, &c.

TITHES (A.-S. *teotha*, a tenth; Lat. *decima*, i. e., *pars*, a tenth part), the tenth part of the produce of the land, which, by ancient usage, and subsequently by law, is set aside for the support of the clergy, and other religious uses. This provision for the clergy passed at a very early period from the Jewish into the Christian Church, and indeed the same or some analogous appropriation has been traced in the other ancient religions. It is observable under the patriarchal system in the words employed by Jacob (Gen. xxviii. 22), and in the offering of Abraham to Melchisedec (Gen. xiv. 20); and mystical reasons have been devised for the selection of the tenth part, rather than any other fractional portion of the produce of the earth, to be consecrated to the uses of religion and the ministers of religion. (See Spencer, *De Legibus Hebræorum*, iii. 1—10.) The details of the institution among

the Jews will be found in Levit. xxvii., Deut. xiv., and many other places. The tribe of Levi not having lands assigned, as was the case with the other tribes, drew their support from this impost.

In the Christian dispensation, the very circumstance of the existence of the clergy as a distinct class supposed a certain fixed provision for their maintenance. The necessity of such provision, and the right on which it is founded, is distinctly expressed in many passages and allusions of the New Testament, as Matt. x. 10, Luke x. 7, Rom. xv. 27, 1 Cor. ix. 7—14. The obligation in the general sense which these passages involve has been put forward in ecclesiastical legislation from the earliest period. The apostolical canons, the apostolic constitutions, St Cyprian on *The Unity of the Church*, and the works of St Ambrose, St Chrysostom, St Augustine, and the other Fathers of both divisions of the church, abound with allusions to it. As yet, however, this obligation was discharged mainly in the form of voluntary offerings; and the legislation of the first Christian emperors, while it presupposed the duty of maintaining the clergy, and even assigned lands and other property for their support, did not extend to any general enactment for the payment of the tenth of the produce of the lands. The Council of Tours, 567 A.D.; the second Council of Macon, 585; that of Rouen, 650; of Nantes, 660; of Metz, 756; and some others, distinctly sanction that form; and at length Charlemagne by his capitularies formally established the practice within those portions of the ancient Roman Empire to which his legislation extended.

From this and other sources, the payment of a tenth to the church extended throughout Western Christendom. By some, the claim was held to be of divine law; by others, of human institution; but in the gradual progress of relaxation, it came to pass that the right thus established solely for the church began to be usurped for themselves and for purely secular uses by nobles or other powerful laymen See IMPROPRIATION.

The first introduction of tithes into England is ascribed to Offa, king of Mercia, in the close of the 8th century. The usage passed into the other divisions of Saxon England, and was in the end made general for all England by Ethelwulf. It would seem that at first, although all were required to pay tithes, it was optional with each to select the church to which his payment should be made; but by a decretal of Innocent III., addressed to the Archbishop of Canterbury in 1200, all were required to pay tithes to the clergy of their respective parishes, and this parochial distribution of tithes has ever since obtained in England. The ancient canon and civil law distinguishes many varieties of tithes, into which we shall not enter, as royal, indominicate, fiscal, salic, &c. We shall confine our remarks to the provisions of the English law, premising that in most respects it is founded upon the general principles of the civil and canon law.

Tithes are of three kinds—*prædial*, *mixed*, and *personal*. Prædial tithes are those which arise immediately from the earth itself, as of grain of every kind, fruits, and herbs. *Mixed* tithes are those proceeding from things nourished by the earth, as calves, lambs, pigs, colts, chickens, milk, cheese, eggs, &c. *Personal* tithes are those arising from the profits of personal industry, in the pursuit of a trade, profession, or occupation; but it is commonly held that personal tithes were ordinarily paid in the form of a voluntary offering at Easter or some other period of the year. From these explanations, it will be understood that no tithe was due from the proceeds of mines or quarries, as their produce is not the result of any growth or increase of the earth, but forms part of its substance; nor from houses, as having no annual increase. The common law, moreover, held wild animals, game, fish, &c., not to be proper subjects of tithe, as also tame animals kept for pleasure or curiosity, and not for profit or use.

A more arbitrary distinction is into *great* and *small* tithes, the first being tithes of corn, hay, wood, &c.; the second being the other kinds of prædial tithes, as well as all personal and mixed tithes. This distinction, although purely arbitrary, is important, inasmuch as the great tithes of a parish belong to the Rector (q. v.), and the small tithes to the Vicar (q. v.). T. were originally paid 'in kind;' that is, by the actual numeration of the products of the land, and the apportionment in each of the numerical tenth part, as of the tenth sheaf, the tenth lamb, calf, &c. The inconvenience and trouble, as well as the unsettled and variable quantities involved in this mode of payment, led to early attempts to provide other modes of apportioning the result (the particular manner being called technically a *modus decimandi*, or simply a *modus*). This was done either by making an agreement to pay a fixed quantity irrespective of actual produce in each year, or by a money payment settled between the parties; or by a partial substitution of payment or labour, as when the party contributed a smaller quantity of produce, but free from the expense of harvesting, carriage, &c.; or finally, by a payment of a bulk sum in redemption of the impost, either for a time or for ever, as the case might be, in which case the land so redeemed became temporarily or permanently tithe-free. By such compositions, many lands in England were made anciently tithe-free, and have so continued; but by 1 Elizabeth 19, and 13 Elizabeth 10, such alienations of tithe-payment were restricted to a term of twenty-one years, or three lives.

Besides the exemption from tithe thus created, a still more comprehensive occasion of immunity is traceable to the exemption enjoyed by the lands of religious houses. Originally, convents occupying lands in England paid tithes like other landowners to the parochial clergy; but a decretal of Paschal II. exempted them from such payments in regard to lands held by themselves in their own occupation. This exemption was confined by subsequent legislation to the four orders—Templars, Hospitallers, Cistercians, and Præmonstratensians, and after the 4th Council of Lateran (1215), only in respect of lands held by them before that year. Frequently, however, exemptions were given in favour of particular houses; and in cases in which religious communities were themselves the incumbents of a parish, as they could not pay tithes to themselves, their own lands within such parish became exempt by what was called 'unity of possession.' And thus it came to pass that a large extent of land in England and Wales was held free of tithes. Now, when, on the suppression of monasteries, those lands were assigned to lay possessors, they passed of course into lay hands with the same immunity; and hence this exemption from tithe has become perpetual even in the hands of lay possessors, as, on the other hand, by a similar transfer, lay proprietors have in many instances acquired the right to tithe, and the property of many rectories.

The arrangements between parties for commuting the mode of payment, to which allusion is made above, were permitted, and even protected by law; but they were nevertheless purely voluntary and partial, and the perpetually recurring contests to which the system led, as well as the oppressive nature of the exaction when the parties from whom it was claimed did not belong to the church

established by law, combined to render the impost odious and unpopular; and to such a length did this reach in Ireland, that in the end an organised and general resistance to the payment made it impossible to enforce its collection in great part of three out of the four provinces. A measure of commutation became in the end absolutely necessary. Such commutation had been recommended by committees as far back as 1822, but it was not finally passed into law until 1838. Since that time, various statutes, as well for England as for Ireland, have been enacted regulating the payment of tithe—6 and 7 Will. IV. c. 71, 7 Will. IV. and 1 Vict. c. 69, 1 and 2 Vict. c. 64, 2 and 3 Vict. c. 32, and 5 and 6 Vict. c. 54. The object of these acts for England is to substitute a rent-charge payable in money, but varying on a scale regulated by averages of the price of corn for the seven years preceding for all the other forms of payment, whether under composition or otherwise. This commutation may be voluntarily effected by the parties themselves; but failing such voluntary arrangement, a compulsory commutation is effected by the Tithe Commissioners, in accordance with a valuation and apportionment in every parish of England and Wales. Provision is also made that land not exceeding twenty acres may be given by a parish in commutation of tithes; but this can only be done in the case of ecclesiastical persons, and not for lay impropriators. Similar arrangements have been made in those few Catholic countries in which tithes still continue to be paid.

In Ireland, the settlement was effected by a general commutation of tithe into a money rent-charge, regulated by a valuation of the tithes (one-fourth being deducted for the cost of collection), and payable directly by the proprietors, to whom is left the charge of receiving it from the occupiers of the land.

TI'THING, an ancient Saxon division of the country, consisting of the tenth part of a hundred, being occupied by ten families, each of whom was responsible for the good behaviour and peace of the rest. The institution has been long growing obsolete, and the Police Constables (q. v.) now supersede the officer called a tithing-man.

TITHO'NUS, son of Laomedon, brother of Priam, and spouse of Eos, the goddess of Morn. The story is that Eos, in asking immortality for her spouse, forgot to ask at the same time eternal youth, so that in his old age he became completely shrunk and decrepit, whereby his 'cruel immortality' was rendered a burden to him.

TITIAN, or TIZIANO, VECELLI, the head of the Venetian School, and one of the greatest painters that ever lived, was born of a good family at Capo del Cadore, in the Friulian Alps, in the year 1477, or, according to some, in 1480. His predilection for drawing caused his father to send him to Venice at the age of ten, that he might learn to be a painter. His instructors were Sebastiano Zuccati and the two Bellinis, particularly Giovanni; but the painter that exercised the greatest influence on his style was Giorgione (q. v.). So vivid and keen was his appreciation of the distinctive features of any artist's work, that he never failed to reproduce them with striking fidelity, and even to leave the impression that he had beaten the master whom he imitated, in his own style. It was owing to this irrepressible superiority that the friendship between Giorgione and him was interrupted. The first work that brought T. prominently into notice was his completion of the 'Homage of Frederick Barbarossa to Pope Alexander III.' (1512), begun by Giovanni Bellini, but left unfinished by that artist at his death. The Venetian senate, who had commissioned the piece, were so much pleased with T.'s performance, that they conferred on him an office with an annual salary of 300 crowns. In 1514, he painted 'Bacchus and Ariadne,' and other works of a similar kind, for the Duke of Ferrara, a portrait of the duke himself, and of the lady who afterwards became his wife, besides a picture of the 'Tribute-money.' While residing at the court of Ferrara, he made the acquaintance of the poet Ariosto, who sat to him for his portrait. On his return to Venice, he painted an 'Assumption of the Virgin,' one of his grandest achievements. His reputation now rapidly rose. Pope Leo X. and Raphael both invited him to Rome, and Francis I. to France; but he declined. During 1520—1530, the most celebrated of his numerous productions were—'St Peter, Martyr,' a work of unsurpassable beauty; 'Victory of the Venetians over the Janizaries;' and 'St Sebastian.' In 1530, his friend Aretino (q. v.), the poet, introduced him to the notice of the Emperor Charles V., whose portrait he painted at Bologna, and who gave him several other commissions. From Bologna, T. proceeded to Mantua, where he executed a great number of works for Duke Frederico Gonzaga. In 1532, he appears to have accompanied Charles to Spain, where he remained for three years, and painted several of his masterpieces, now found in that country. In 1537, he executed an 'Annunciation;' in 1541, a 'Descent of the Holy Ghost upon the Apostles,' a 'Sacrifice of Abraham,' 'David and Goliah,' and a 'Death of Abel;' and in 1543, pictures of the 'Virgin' and 'San Tiziano,' and portraits of Pope Paul III., Cardinal Farnese, and Duke Octavio Farnese, at Rome, where he remained three years. The Emperor Charles V., who greatly admired his genius, twice called him to Augsburg (1547 and 1550). Among the religious works which he executed for Philip II. of Spain are a 'Last Supper,' 'Christ in the Garden,' 'St Margaret with the Dragon,' and a 'Martyrdom of San Lorenzo;' besides these, we notice a 'Venus and Adonis,' a 'Danaë,' a 'Medea and Jason,' and other classic subjects. A complete catalogue of T.'s works does not exist, but the number known is extraordinarily great—upwards of 600. T. died of the plague in 1576, having attained the extreme age of 99. He is best studied at Venice or Madrid, but splendid specimens of his work are to be seen in the chief European galleries. As already observed, he had at first a tendency to reproduce the style of acknowledged masters, but his genius soon emancipated itself from all imitativeness, and displayed a glorious originality and power. The luxury of light did never so enrich a painter's canvas. This is, indeed, his transcendent excellence. Not inaccurate in design, not sterile in invention, not infelicitous in composition—these, his minor merits, are nevertheless wholly thrown into the shade by the splendour, boldness, and truth of his colouring, which alone has sufficed to give him a place alongside the greatest names in art, Raphael, Leonardo da Vinci and Michael Angelo.—See Hume's *Notices of the Life and Works of Titian* (Lond. 1829); Northcote's *Life of Titian, with Anecdotes of the Distinguished Persons of his Time* (2 vols., Lond. 1830).

TITICA'CA, LAKE. See PERU.

TITLARK AND TITLING. See PIPIT.

TITLE, REGISTRATION OF, in England, is a modern experiment, set on foot after long-continued opposition, and still frowned on by the solicitors, who conceive that its operation will be to reduce

their emoluments. Owing to the total want which had always existed of a register for deeds or writs connected with the transfer of land, except in the counties of Middlesex and York, the complexity and uncertainty attending the operations of conveyancing had long been the opprobrium of English law, and the mercantile classes at last called for a remedy by which an acre of land might be sold with the same expedition and certainty as bank stock. Under the existing system, so far from expedition being a feature of conveyancing, delay, expense, and insecurity were the chief characteristics. It was and is the inveterate practice for a purchaser of land to demand, and for the vendor to give, what is called a sixty years' title—i. e., he must shew the successive owners of the land for the sixty years previous to the sale, and all that these owners did in connection with it. This created great expense and delay. But if the property were sold next month, or next day, precisely the same process had to be repeated between the new purchaser and his vendor, for what might have been done between other parties previously was not binding, nor was it safely to be acted on by their successors in the property. These evils called loudly for some remedy, and of late years all the legal reformers have been busy with projects to provide some relief. An important impetus was given to a reform by the passing of the Irish Encumbered Estates Act in 1848, the object of which was to break up and compel a sale of the deeply encumbered estates of Ireland. So deeply involved had many of the estates there become, that the nominal owners were merely collectors of the rents for the benefit of others, and all improvements were paralysed. The object of the act was to compel a sale of the fee-simple; and by means of a court specially created for the purpose, called the Encumbered Estates Court, all those who had an interest in the property were summoned to appear and discuss their mutual claims and priorities, and assess, as it were, their pecuniary interest, and the proportion of the total value to which they were entitled; and then the court judicially solved all difficulties, and swept off the property by selling it with a clean title to a purchaser, and dividing the proceeds among all those who claimed a share. The effect was, that a fresh title, free from all prior encumbrances, was given to the purchaser, and thereby the subsequent history of the property was cut off entirely from what had gone before. The court was attended with great success, and subsequent acts perpetuated it as a standing institution of the country, it being found that the clear title thereby obtained was eagerly sought in the market. The court, though at first created for what were supposed to be temporary purposes, has now been called the Landed Estates Court, and its jurisdiction extended not merely to encumbered, but to unencumbered land. In 1854, a similar statute was applied to the estates of the West India Islands, and a court established in London for the purpose of clearing off the encumbrances of those estates, and selling them with a clear title to purchasers. In 1859, a bill was brought into the House of Commons to establish a similar court for England, but owing to the opposition experienced, and to various changes caused thereby, it was not till 1862 that two acts were passed, which provided only an instalment of this much-desired reform. The object of the acts 25 and 26 Vict. c. 53, 67, one of which is called Lord Westbury's, and the other Lord Cranworth's Act, is to enable owners of land to register their estates with indefeasible titles, and to simplify the title by judicial sales effected by the Court of Chancery. The mode of operation is as follows: When a freehold estate is desired to be registered as indefeasible, an application is made to the registrar of the Land Registry, who officially examines the title, and then gives a certificate that the title is indefeasible. Or, if the owner prefer it, he can obtain a similar declaration from the Court of Chancery. Part of the title consists in a map of the lands, which is deposited in the office. The great advantage of getting an indefeasible title from the office is, that the owner is then perfectly certain that he can defy all comers to interfere with his land, and that in the event of his selling it, there is no necessity for the purchaser to re-examine the title, it being stereotyped, as it were, for permanent use, and so all subsequent expenses are avoided. The details attending the scheme of the Land Registry need not be further given. After the statute had been in operation two years, it was found that the progress made by the new institution had been slow; but considering that the adoption of its benefits was voluntary, and not compulsory, and that it was opposed by the solicitors as a body from interested motives, it was stated in parliament that the progress made was satisfactory, and equal to that of other similar reforms which had, after similar early difficulties, taken firm root in the country.

TITLE-DEEDS are the evidences of ownership of real property in this country. Each owner is supposed to be in possession of his own, either by himself or his solicitors; and the ownership of the title-deeds passes along with that of the lands themselves. In England there is no general register where title-deeds can be kept for safe custody; but in the counties of Middlesex and Yorkshire they must be registered. It is a dangerous thing to part with title-deeds, for, by merely pledging them as a security for money, a mortgage may be created over the lands. In Scotland there is a general register where all title-deeds may be kept, or authentic copies, so that the loss of one may be replaced without much difficulty.

TITLES OF HONOUR, designations to which certain persons are legally entitled, in consequence of possessing particular dignities or offices. King and Emperor are titles of honour belonging to the sovereigns of different countries; and Your Majesty is the form of address to which, by the usage of most European countries, they are entitled. Your Grace was in England, in former times, the usual mode of addressing the sovereign. The epithet Majesty, taken from the *majestas* of the emperors of Rome, was adopted by the emperors of Germany, who considered themselves their successors; but its use by other European sovereigns is of comparatively recent date. Henry VIII. was the first king of England, and Henry II. the first king of France, who adopted it. Your Highness is the style adopted by the sultan of Turkey. The proper style of the reigning sovereign of the United Kingdom is, 'Victoria, by the Grace of God, of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith.' The sons of the sovereigns of England are styled Princes, and their daughters Princesses; and the sovereign's eldest son is Prince of Wales (q. v.). The title of Royal Highness is given to all the children of the sovereign, and by letters-patent under the Great Seal in February 1864, her Majesty declared her pleasure that the children of the sons of the sovereign should also enjoy the same title. The different grades of the peerage have their several titles—Duke, Marquis, Earl, Viscount, and Baron—each of which was in its origin a name of office involving certain specific duties. See FORMS OF ADDRESS, COURTESY TITLES.

Though most European countries have their dukes, marquises, counts, viscounts, and barons, these often differ considerably in rank from the seemingly corresponding titles in Britain, and the English rules and practices regarding title are not applicable abroad. The complicated system of titles by law, and still more by courtesy, which prevails in England, is a source of endless perplexity to such foreigners as endeavour to make themselves acquainted with our English usages.

TI'TULAR, one who enjoys the bare title of an office, without the actual possession of that office. Thus, the English kings styled themselves kings of France from the time of Henry IV. down to the year 1800; and previous to the recent changes in Italy, the king of Sardinia, as well as the king of Naples, was titular king of Jerusalem. In English Ecclesiastical Law, a titular is a person invested with a title, in virtue of which he holds a benefice, whether he performs its duties or not. —In the law of Scotland, the term has received another acceptation. When the king, at the Reformation, became the proprietor of all church lands, he erected the monasteries and priories into temporal lordships, and bestowed them on laymen, who were known as Lords of Erection, or Titulars; this latter name indicating that they had the same title as had formerly been possessed by the religious houses to the lands and tithes. See TEINDS.

There are many titular dignities in the Roman Catholic Church; but the class of them which is chiefly noticeable is that which has grown out of the separation between the Eastern and Western churches. It is well known that the Roman pontiff, notwithstanding the schism, claims to retain authority over the entire extent of Christendom; and even where there is not any longer resident within the limits of an ancient church or province a body of Christians of the Roman communion, the pope claims to appoint an ecclesiastic to be bishop, metropolitan, primate, or patriarch of the ancient see (see IN PARTIBUS INFIDELIUM). In England, and still more in Ireland, where archbishops and bishops of the Roman Catholic Church exist *de facto*, but not *de jure*, they are styled titular.

TI'TUS, EPISTLE TO, one of the three 'Pastoral Epistles,' was written by St Paul, probably in the latter part of his life, and after he had been liberated from his first imprisonment at Rome. From the 12th verse of chapter iii., we learn that the apostle was staying at Nicopolis when he wrote the letter, and the subscription identifies this place with Nicopolis of Macedonia; but this is impossible, for, as De Wette notices, that city appears to have been founded by the Emperor Trajan long after St Paul was dead. Jerome's opinion is probably the correct one, that the Nicopolis referred to was the famous city in Epirus. The Epistle concerns itself mainly with the organisation and discipline of the church in Crete, is very practical, and at times unpleasantly sharp in its tone, as if Paul had felt more acutely than usual the vexations which 'unruly and vain talkers and deceivers, *specially they of the circumcision*,' caused him. Above all things, however, he is nobly solicitous that the Christians of Crete should prove the sanctifying power of their new faith by rising superior to the immoral practices of heathenism.—See the Commentaries of Chrysostom, Jerome, Aquinas, Luther, Melanchthon, Calvin, Cocceius, Grotius, Rosenmüller, De Wette, Alford, Wordsworth, Ellicott, &c.

TI'TUS FLAVIUS SABINUS VESPASIANUS, emperor of Rome, was the eldest son of Vespasianus (q. v.) and Flavia Domitilla, and was born at Rome 30th December 40 A.D. Brought up at the court of Nero along with Britannicus, the son of the Emperor Claudius, he received an excellent training both of body and mind, became an adept in manly exercises, and an accomplished scholar; and subsequently, as *tribunus militum* in Germany and Britain, and commander of a legion in Judæa under his father, proved his qualities as a soldier and a general. On his father's elevation to the imperial throne, T. was left to prosecute the Jewish war, which he brought to a close by the capture of Jerusalem after a long siege. The news of the success was received with the utmost joy, and Vespasian's too suspicious temper was awakened. However, T., by returning to Rome, and laying the trophies of victory at the emperor's feet, removed his unfounded jealousy, and father and son obtained the honour of a joint triumph (71 A.D.). About this time T. became his father's colleague in the empire, and the impression which the conduct of the young conqueror made upon the Roman people was, and with just reason, very unfavourable. He gave himself up to the pursuit of pleasure in all its forms, put to death various suspected persons very summarily, and even caused one of his guests, whom he justly suspected of conspiracy, to be assassinated as he left the palace. His *liaison* with Berenice, the daughter of Herod Agrippa I. (q. v.), was also very distasteful to the Romans; and on the death of his father (79 A.D.), whom he was at that time believed by a few to have poisoned, the Romans had satisfied themselves as to the advent of a second Nero. But T.'s behaviour after his hand grasped an undivided sceptre completely belied their anticipations. The very first act of his reign was to put a stop to all prosecutions for *læsa majestas*, which had abounded since the time of Tiberius (q. v.); informers were scourged in the forum, dragged along in front of the theatres, and then either sold as slaves or banished. The ancient and venerated buildings of Rome were repaired; new ones, as the Colosseum (see AMPHITHEATRE) and the baths which bear his name, were erected; and the prominent tastes of the populace were abundantly gratified by games on the most stupendous scale, which lasted for 100 days. T.'s beneficence was unbounded, and it so happened that during his brief reign there was the most urgent need of its exercise. In 79 A.D. occurred the great eruption of Vesuvius, which overwhelmed Herculaneum and Pompeii, and ruined numerous other towns and villages; in 80 A.D., a fire broke out in Rome, which raged for three days, destroying the Capitol, Augustus's library, Pompey's theatre, and numerous houses; and in the tracks of these calamities followed a dreadful pestilence. T. dealt out gifts with lavish hand to the houseless and ruined sufferers; he even despoiled his palaces of their valuable ornaments, to obtain money for distribution, and schemed and planned to furnish occupation for them. He was now the idol of his subjects, the 'love and delight of the human race;' but, unfortunately for that part of the human race over which he ruled, in the commencement of the third year of his reign, he became suddenly ill, and died at his patrimonial villa in the Sabine country (September 13, 81), not without the suspicion that he had been poisoned by Domitian, his younger brother.

TIUME'N, a town of West Siberia, in the government of Tobolsk, stands on the Toura, an affluent of the Ob (q. v.). Its advantageous situation on the highways, both by land and water, which communicate between Russia and Siberia, has made it an important commercial centre, and the seat of flourishing manufactures. The vessels which navigate the Ob, the Irtish, the Tobol, and the Toura, for the most part receive their cargoes here. Large

quantities of leather, leather-goods, carpets, soap, candles, and common pottery are manufactured and exported throughout W. Siberia, the Ural countries, the Kirghis Steppes, Khokan, Bokhara, and China. Pop. about 15,000.

TIVERTON, a municipal and parliamentary borough in the north-east of Devonshire, 14 miles north of Exeter. There are important weekly markets, and four great markets for cattle annually. There is a large lace-factory in the town belonging to Messrs Heathcoat & Co., in which upwards of 1000 hands are employed. The town is built on a hill between the rivers Exe and Lowman, hence the old names of the town, TWYFORD and TWOFORD-TOWN. The streets in many places are very narrow, but clean. There is a peculiarity about the town in the rapid streams of water flowing down the channels along the sides of the streets. These streams of water were given to the town about the year 1272, by Isabella Rivers, Countess of Devon. The castle was built in 1106. The free grammar-school, an old building in the Elizabethan style, was endowed by Mr Peter Blundell in 1604. In connection with the school there is a scholarship at Balliol College, Oxford, and another at Sydney Sussex College, Cambridge, each of the annual value of not less than £60. There are four exhibitions, of £30 per annum each, for four years, at any college in either university; one exhibition of £50 a year, for seven years, at Balliol College; and one of £25. There are other schools and numerous charities. T. sends two members to the House of Commons. Pop. (1871) 10,025; (1881) 10,462.

TIVOLI (anc. *Tibur*), a poor town of the comarca or province of Rome, 18 miles east from Rome, stands on the slope of Monte Ripoli, one of the Apennines. T. is walled, and has a fortress. The streets are steep, narrow, and beset by beggars. There is a fine cathedral, formerly a temple of Hercules, where Augustus held his tribunal. The surrounding hills are covered with olive trees. The vines of T. are famed for a peculiar sort of grape, in great request for its firmness and luscious flavour, noticed as early as the time of Pliny the Elder. The stone called 'travertino,' of which great part of Rome is built, comes from Tivoli. Pop. 6400. Near T. is the extensive Villa d'Este. Within and without the city, there are many monuments of antiquity. In a commanding position above the falls of the Anio, rises the Temple of Vesta, of a circular form, and in good preservation, built 70 B.C.; there are the extensive remains of the Emperor Hadrian's magnificent villa; the villa of Mæcenas; remains of mausoleums, aqueducts, baths, &c. The place is much visited by tourists for its waterfalls, which are lofty, but not very picturesque.

Tibur long existed as a town (according to ancient tradition) before the building of Rome; but the first mention of it in recorded history occurs 446 B.C., during the Roman decemvirate. It was one of the principal towns of the Latin confederation. Its healthy and picturesque situation induced many of the wealthy Romans to choose it for their country residences. Mæcenas, Scipio, Æmilianus, the famous Marius, Metellus Numidicus, and Munatius Plancus, had their Tiburtine villas. Horace preferred Tibur to all other places of resort (although he makes allusion to its moist atmosphere, calling it 'Udum Tibur'), and had a country-house in the neighbourhood. It is one of the few towns of Latium which still stand on their ancient sites.

TLEMCEN', a town of Algeria, capital of the province of Oran, and 80 miles south-west of the city of that name, stands in an undulating country, everywhere irrigated, and brought completely under cultivation. It contains Catholic and Protestant churches, mosques, and synagogues, and there are numerous educational institutions, including schools for Arabs and Jews. It is protected from the south wind by a range of hills, 4200 feet in height. The town is accessible only from the south-west, the other sides presenting steeply escarped fronts. The district around T. is covered with fruit-trees of all kinds, of which the olive is one of the most valuable, and there is much cultivated land, producing cereals, tobacco, &c. Besides the special markets, a daily market is held, at which cattle, wool, grain, and oils are largely sold. Ostrich feathers and corks are exported; but the trade is for the most part in cloths, hides, grain, and oils. Pop. about 20,000.

TOAD (*Bufo*), a genus of *Batrachia*, of the *Anourous* or tailless order, and suborder of *Arcifera Bufoniformia*. See BATRACHIA. The original genus has been subdivided, and is now constituted into a family, *Bufonidæ*, to all which the popular name T. is often extended. The form resembles that of the frogs, but is more thick and clumsy, and the hind-legs are generally short, so that the species rather crawl than leap; some of them, indeed, are not known to leap at all. The skin is warty, and the warts or tubercles produce a milky exudation, which in some species is very fetid. Behind the ear there is a porous pad—a very large parotid gland—from which a copious exudation takes place. The muzzle in the restricted genus *Bufo* is rounded, but some of the family have an elongated muzzle. The mouth of the true toads is destitute of teeth. The food of toads consists chiefly of small insects and slugs, and they mostly inhabit shady places, avoiding the sunshine, and crawling about either amongst the stems and leaves of plants or amongst stones. In their adult state, they are much less aquatic than frogs, but their spawn is deposited in water, in which their tadpoles live like those of frogs. They are commonly regarded with disgust, on account of their appearance, the exudation from the skin, and the smell of many of them, yet the eye of the T. is remarkably beautiful. A notion has very generally prevailed that the exudation of the skin is venomous, but it is unsupported by evidence, and toads are handled with perfect impunity. They are eaten by some savage tribes.—Only two species are British. The COMMON T. (*B. Americanus*) is abundant in most parts of North America. A description of it is unnecessary. It spends the winter in a dormant state, and issues from its retreat on the return of spring. Its spawn is deposited in March or April, and resembles that of the frog, but the ova are smaller and more numerous, and are discharged in a long albuminous tube, which is coiled spirally in the water. The young T. is very small when it loses its tail and gills and exchanges the tadpole for the adult form. Toads are very useful in gardens, in preventing the excessive increase of some kinds of insects; and on this account, it is a frequent practice to put them into hot-bed frames, for which use the market-gardeners of the neighbourhood of London often purchase the European species at the price of fourpence each. They have occasionally been tamed, and display some intelligence, readily recognising those who feed them and are kind to them. A tame T., of which an account is given by Pennant in his *British Zoology*, lived for more than forty years, and was at last killed by a raven.

Numerous instances are on record in which toads are said to have been found embedded in rocks, walls, and even in the trunks of trees, where the necessary conclusion is that they must have lived a very long time, in a dormant state. Unfortunately, however, the discovery of these toads has almost always been made by unscientific

persons, and there is a want of proper and trustworthy observations as to the places in which they have been found. Attempts have been made by several naturalists, and among others by the late Dr Buckland, to throw light on the subject by experiment, immuring toads in various ways, and the result, although shewing that when air is not wholly excluded, they are capable of living for a long time in their imprisonment, probably in a dormant state, is not favourable to the belief that such existence could extend over many years. An interesting account of Dr Buckland's experiments will be found in Mr F. Buckland's *Curiosities of Natural History.*

The other British species of T. is the NATTERJACK (*Epidalea calamita*), which was first described as British by Pennant, and has since been found to

1, Common Toad (*Bufo vulgaris*); 2, Natterjack (*Epidalea calamita*).

be pretty abundant in some parts of England, and in the south-west of Ireland, chiefly in the vicinity of the sea. It much resembles the common T., but is of a yellowish-brown colour, clouded with dull olive, a bright yellow line passing along the middle of the back. It has a disgusting smell. It never hops, and its motion is more like walking or running than the crawling of the common toad.—Several other species of T. are found in Europe. Some of those found in tropical countries attain a very large size, and exhibit protuberances of various kinds, far exceeding even in proportion the warty excrescences of the common toad.

TOADFLAX (*Linaria*), a genus of plants of the natural order *Scrophularineæ*, very closely allied to SNAPDRAGON (q. v.), from which genus this has but recently been separated, and is distinguished chiefly by the spur at the base of the corolla, and the capsule opening by valves or teeth, not by pores.—The species are herbaceous plants, natives chiefly of the colder and temperate parts of the Old World. Some of them are natives of Britain, of which the most common is *L. vulgaris*, a species with erect stem of 1—3 feet high, glaucous linear-lanceolate leaves which thickly cover the stem, and terminal spikes of yellow flowers. It grows in hedges, the borders of cornfields, &c. It possesses purgative and diuretic properties, and a decoction of it is used as a fly-poison; but it is regarded as a troublesome weed by farmers. It has found its way, probably along with grain or other grass seeds, into the United States. A very remarkable monstrosity is sometimes seen in this plant, to which the name *Peloria* has been given, the flower presenting five spurs, and five usually imperfect stamens.—*L. Cymbalaria*, a pretty little plant with trailing stems and 5-lobed cordate leaves, is often planted to cover old walls, &c., and is either a native of Britain, or naturalised in many places.

TOADSTONE, a local Derbyshire name for a soft and earthy variety of trap, looking like an argillaceous deposit.

TOAST (Lat. *tostus*, scorched or roasted) is the name given to bread dried or scorched before the fire. So early as the 16th c., toasted bread formed a favourite addition to English drinks. Sack was drunk with toast, and so was punch. The practice of drinking healths, particularly that of an entertainer, is one so natural, so likely to spring up spontaneously, that it is impossible to say when it began. Certain it is, however, that it received an artificial development owing to the prevalence of convivial habits in the 17th century. Then it became the fashion to drink not to the health of entertainers only, but to that of each guest, of absent friends, and more especially of the unmarried woman whose attractions were most generally acknowledged. It also became the custom to describe a woman whose health was so drunk as herself 'a toast.' In this sense, the application of the word is said to have had its origin in an incident which occurred at Bath, and which is recorded in the 24th number of the *Rambler*, in the following passage: 'It happened that on a public day, a celebrated beauty of these times' (when it was the fashion for ladies to bathe publicly in elegant dresses made for the purpose) 'was in the Cross Bath, and one of the crowd of her admirers took a glass of the water in which the fair one stood, and drank her health to the company. There was in the place a gay fellow, half fuddled, who offered to jump in, and swore, though he liked not the liquor, he would have the toast' (making, of course, allusion to the custom of putting toast in punch). 'He was opposed in his resolution; yet this whim gave foundation to the present honour which is done to the lady we mention in our liquor, who has ever since been called a toast.' Whatever may be the origin of the use of the word 'toast' in this sense, we now apply it not only to any person, but to any sentiment mentioned with honour before drinking. The French have adopted the word 'toast' from us; making it masculine when applied to a man or a sentiment, but feminine when applied to a woman. —See Chambers's *Book of Days.*

TOBA'CCO (of uncertain derivation, but most probably from the native American name), a genus (*Nicotiana*) of plants of the natural order *Solanaceæ*, having large broad leaves; a 5-parted calyx; a funnel-shaped, 5-lobed corolla, and five stamens; the flowers growing in panicles at the top of the stem; the fruit a 2-celled, 5-valved, many-seeded capsule. The species are mostly herbaceous plants, rarely shrubby, with large broad leaves, and everywhere covered with clammy hairs. They are natives of warm countries, most of them American, although some are found in the East Indies. They all possess the narcotic property, on account of which a few of them are extensively cultivated. It resides in almost all parts of the plant, although the leaves are almost exclusively used. The most important species is the COMMON T. or VIRGINIAN T. (*N. tabacum*), a native of the warm parts of America, the cultivation of which had extended before the discovery of the New World

by Columbus, far to the north of the regions in which the plant appears to be indigenous. It is about 5 or 6 feet high, erect, with lanceolate, sessile leaves, 6—18 inches long, and rose-coloured flowers, the throat of the corolla inflated, the segments pointed. There are numerous varieties, differing more or less in the size and form of the leaves, and in the form and colour of the flowers, some of which are regarded by some botanists as distinct species.

Virginian Tobacco (*Nicotiana tabacum*).

Green Tobacco (*Nicotiana rustica*).

One of these is the BROAD-LEAVED T., or MARYLAND T., which has a thicker stem, and much broader leaves. The GREEN T. (*N. rustica*), sometimes called ENGLISH T., because it was the first kind introduced into England for cultivation, is a smaller plant, from 3 to 5 feet high, with ovate, stalked leaves, and the segments of the corolla rounded, its tube cylindrical. It is a native of the East, but is more hardy than the Virginian T., and is therefore cultivated in more northern regions. The PERSIAN T. (*N. Persica*) has the root-leaves oblong, those of the stem lanceolate and sessile; the corolla salver-shaped, with a long tube; its lobes rather unequal. It is a native of Persia, and furnishes the Shiraz T., so much esteemed in the East, and which is milder than the common tobacco. Other species of T. are used in different parts of America, and some of them are cultivated to a small extent, as *N. repanda*, in Cuba; *N. quadrivalvis*, by the Indians on the Missouri; *N. multivalvis*, by the Indians on the Columbia; and *N. nana*, by the Indians of the Rocky Mountains.

It is somewhat doubtful whether the use of T. as a narcotic was known in the East before the discovery of America. Meyen, in his *Geography of Plants*, expresses the opinion that the smoking of T. is of great antiquity amongst the Chinese, because on very old sculptures he has 'observed the very same tobacco-pipes which are now in use.' Meyen's authority, however, is greater as a botanist than as an archæologist, and cannot be received as decisive of the antiquity of the sculptures of which he speaks. It is not improbable that the smoking of T. has been long practised in China, but it is not certain. If it was so, the custom did not extend amongst neighbouring nations, which, however, has been the case also as to the use of some other narcotics; whereas, on the introduction of the use of T. from America, it rapidly extended throughout Europe, and soon became extremely prevalent amongst Oriental nations. In the present state of our knowledge, no ethnological argument can be founded upon the prevalence of smoking amongst the Mongolians and the American Indians. The smoking of T. was found by Columbus to be practised in the West Indies, where the natives made it into cylindrical rolls, wrapped in maize-leaf. It has been prevalent from unknown antiquity amongst the American Indians as far north as Canada. With them it even has a religious character, and is connected with their worship and with all their important transactions. Thus, the Calumet (q. v.), or pipe of peace, is indispensable to the ratification of a treaty, and smoking together has even greater significance of friendship than eating together has amongst other nations. 'In the belief of the ancient worshippers, the Great Spirit smelled a sweet savour as the smoke of the sacred plant ascended to the heavens; and the homely implement of modern luxury was in their hands a sacred censer, from which the hallowed vapour rose with as fitting propitiatory odours as that which perfumes the awful precincts of the cathedral altar, amid the mysteries of the church's high and holy days.'—Wilson's *Prehistoric Man*, i. 383. The seeds of the T. plant were first brought to Europe by Gonzalo Hernandez de Oviedo, who introduced it into Spain, where it was first cultivated as an ornamental plant, till Nicolo Menardes extolled it as possessed of medicinal virtues. It was introduced into Italy in 1560. The use of T. in the form of snuff soon followed its introduction for smoking. There is no reference to the use of T. in Shakspeare, yet it is certain from other evidence that it was well known in England in his time, although at first its use was confined to the wealthy, as the price was very high, and it was smoked in very small pipes—probably the same which are known to antiquaries as *Elfin Pipes*—and the smoke was expelled, not from the mouth, but by the nostrils, in which way the narcotic power of the herb is much greater. T. was at first recommended for medicinal virtues, which were greatly exaggerated, but soon became an article of luxury. The popes Urban VIII. and Innocent XI. fulminated against it the thunders of the church; the priests and sultans of Turkey declared smoking a crime, Sultan Amuret IV. decreeing its punishment by the most cruel kinds of death; the pipes of smokers were thrust through their noses in Turkey; and in Russia, the noses of smokers were cut off in the earlier part of the 17th century. King James I. of England issued a *Counterblaste to Tobacco*, in which he described its use as 'a custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in the black, stinking fume thereof nearest resembling the horrible Stygian smoke of the pit that is bottomless.' All opposition, however, was in vain. The use of T. increased, and has continued to increase to the present day, when it is more prevalent than at any former time, the luxury of rich and poor, of civilised nations and of savage tribes. Although it did not become prevalent in the East till the 17th c., the Turks and Persians are now the greatest smokers in the world; in India, all classes and both sexes smoke; in China, the practice—perhaps there more ancient—is universal, and girls, from the age of eight or nine, wear, as an appendage to their dress, a small silken pocket to hold tobacco and a pipe. How the practice of smoking has increased in Britain, every one knows. The use of snuff has not increased

in the same manner, but has rather diminished. T. is used in the three modes of smoking, chewing, and snuffing. Plugging, the stuffing of the nostrils with quids of T., has been almost universally discontinued, although at one time it was practised to a small extent. In Britain, chewing is now chiefly practised by sailors, smoking being prohibited or restricted at sea, on account of the danger of fire; but it is very prevalent in some parts of the world, particularly in North America. The smoking of T. is everywhere more or less social, like the use of wine; and the snuff-box is handed from one to another in token of good-fellowship.

T. derives its botanical name (*Nicotiana*) from Jean Nicot, who introduced it into France. In that country, its use in the form of snuff began in the reign of Francis II. About the same time, a snuff-manufactory was established at Seville, which produced the celebrated Spanish snuff. The T. plant was soon after introduced into other countries of Europe. In 1657, the manufacture and sale of T. were farmed out in Venice, and began to yield a considerable revenue. Much revenue has since been derived from the same source, in many countries. T. is now extensively cultivated in many parts of Europe, as well as in Asia and America. Prohibitory laws alone prevent its cultivation in the southern parts of Britain and Ireland, of which the climate is quite suitable to it. The quality of the leaf, however, deteriorates in the more northern regions in which it is cultivated, as in Germany, when it is continuously raised from home-grown seed, and seed is therefore imported from warmer countries.

Cultivation and Commerce.—The cultivation of T. requires a rich loose soil, and the strongest manures are advantageous. The influence of soil, climate, and manures on the quality of the produce is very great, almost beyond what is known in any other cultivated plant. Vegetable manures are best for T. intended for smoking; animal manures are preferred for that which is to be made into snuff. In the more northern regions in which T. is cultivated, the seed is sown in a hot-bed, protected from frost by mats, and the plants are planted out in rows from two feet to three feet apart in the field. The ground is frequently hoed and stirred. Where the plants are not intended for seed, the top is usually broken off, so as to prevent flowering, that its whole strength may be directed to the leaves. In America, when the leaves begin to become yellow, or are marked with yellow blotches, the plants are cut down, and hung up in a large barn to dry; but in Germany, the leaves are gathered as they become yellow, are tied in small bunches, and are hung up in a shady place to dry.

The cultivation of T. is comparatively easy, and although a warm climate suits it best, it is without much difficulty raised in most parts of Europe. The usual plan in the great tobacco-producing countries is to sow the seed in seed-beds of rich soil, and as the seed is extremely minute, it is first mixed largely with sand or wood-ashes, to assist in spreading it thinly. In Virginia, which may be taken as one of the best tobacco-growing districts, this is usually done in the first week in January. After the seed-beds have been carefully prepared and sown, small branches of trees are laid over, to protect the seed, when it germinates, from the effects of frost; but these are removed as soon as can be done with safety, and the plants then grow rapidly, and are ready for transplanting into the fields about the beginning of June. The land in the fields is very carefully prepared, and small hillocks are raised up in rows; each is about a foot in diameter, and flattened at the top. With the first appearance of rain, the plants are carefully raised from the seed-beds, and carried usually by children, who deposit one on each hillock, on which it is carefully planted by experienced men, who follow after the children. Only wet weather will do for planting, so that this operation often lasts until the end of July. When planted, the tobacco-crop requires much careful attention, to weeding, and a watchful eye to prevent the ravages of various insect enemies. Much of this latter work is done by flocks of turkeys, kept on purpose by the planters. As soon as the plants begin to throw up the flower-shoot, it is nipped off; otherwise it would weaken the leaves; but this process is neglected in some countries, especially in Turkey and Greece, where small leaves are preferred, and where, in some cases, as in the celebrated Latakia tobacco, both leaves, buds, and flowers are used. The time generally chosen for cutting it is mid-day, or when the sun is powerful, and the morning and evening dews absent. The cutting is done by hand, and only such plants are chosen as are ready, which is known by a clammy exudation which forms over the leaf, often giving it a spotted appearance. If the plants are very large, the stalk is often split down, to facilitate the drying. They are then removed from the field to the tobacco-house, around which are erected light scaffolds, to which the plants are suspended, generally by passing a thin stick through a split in the stalk of each, and so placing a number of plants on each stick, just near enough to prevent them touching each other. After some time hanging in the open air, the plants on the sticks are removed, and suspended in a similar way inside the curing-house, until the drying is completed. The leaves are next removed from the stalks, and all bad ones rejected. The chosen ones are tied up in bundles called hands, and these are packed in hogsheads, enormous pressure being applied in the packing. These hogsheads are very large casks, which must not contain less than 950 lbs. net in the United States, where the government exercises a very strict surveillance over the weight and quality of all tobacco grown and cured there. Within the last ten years, a large tobacco-export has been carried on by Paraguay. The quality, though not equal to that grown in the United States, is, however, fair, and has been steadily improving. It is always packed in linen bales. Turkey has also, for several years past, been steadily increasing her exports of tobacco to Great Britain. The quality of Turkish tobacco is very peculiar: it is small in the leaf, and of a light colour—either a bright yellow, a yellowish green, or a yellowish brown. Being extremely mild, it is a favourite with many smokers.

Tobacco, owing to the high rate of duty when in any manufactured form, is mostly imported in the leaf; but small quantities are brought in, chiefly for re-export, in various states of manufacture. The chief of these is called Cavendish, which is made by stripping the blades of the leaves from the midribs, and after sprinkling them with an infusion of tobacco made from the stalks and other waste parts, laying them in heaps to heat or ferment. This darkens their colour; and whilst still moist and flaccid, they are laid smoothly upon each other, so as to form cakes about nine inches in length by three in breadth, which are pressed by powerful machinery until they are very compact and hard. Another kind is called Negrohead, which is formed into sticks about an inch thick, and eight or nine in length, which are laid across each other equally, and are then pressed into cakes. When the sticks are pulled apart, the rounded depressions caused by pressing them into one another gives them a slight resemblance to the wavy locks of a negro's hair, whence they receive

their name. The leaf simply twisted into a rope, as in the kind called Varinas Roll and other similar sorts, as well as that which is merely cut small for smoking, is all held to be 'manufactured,' and charged with the highest duty, so that very little indeed is imported.

Cigars and *Cheroots* are also forms of manufactured tobacco; but so much in favour are these with smokers, that the exorbitant duty is very little check upon their importation. The island of Cuba supplies not only the best but also the largest quantity, the Havana tobacco being exceedingly well cultivated and cared for, and being especially well adapted for cigar-making. More than half of all the cigars imported into Great Britain are from Cuba; and the cheroots are chiefly from Manilla. The Philippine Islands also send us about 100,000 lbs. per annum of cigars, and other countries about 200,000 lbs. The total amount sent to Great Britain annually is a little over 600,000 lbs., equal in value to about £350,000. Cigars and cheroots are essentially the

Cigar.

Cheroot.

same; they only differ in form, as represented in the diagrams.

The tobacco received in the leaf is all more or less manufactured in this country. It is either cut finely, so as to be convenient for use in pipes, or made into Cavendish, Negrohead, or Twist; the last is often called *Pig-tail;* and is a continuous string of tobacco about the thickness of a quill, many yards in length, made by twisting and spinning the leaves when flaccid from being wetted and heated as before described; this string is then made up into balls, and is the kind chiefly used by those who chew tobacco.

Snuff is another form of manufactured tobacco largely made in Great Britain. It is formed by grinding the leaf either with or without the leaf-stalks and midribs. The grinding is generally effected in wooden mortars, with pestles also of wood; and some kinds of snuff are prepared from kiln-dried tobacco, whilst others are made from the soft leaves. The varieties are numerous, and fortunes have been made by manufacturers who have been fortunate enough to make a snuff which has become a favourite.

Tobacco is subject to a higher rate of duty, in proportion to its intrinsic value, than any other article. The value of the best sorts in the leaf only ranges from 3*d.* to 9*d.* per pound; whilst the duty is as follows: Unmanufactured, containing 10 per cent. or more of natural moisture, 3*s.* per pound; and if containing less than 10 per cent. of moisture, 3*s.* 6*d.* per pound. The various kinds of manufactured tobacco range from 3*s.* 9*d.* to 5*s.* per pound. The chief regulations touching its importation are as follow: It is prohibited to be imported at any other ports in the United Kingdom than Aberdeen, Belfast, Cork, Cowes, Drogheda, Dublin, Falmouth, Fleetwood, Galway, Glasgow, Greenock, Hartlepool, Hull, Lancaster, Leith, Limerick, Liverpool, London, Londonderry, Newcastle, Newry, Plymouth, Port-Glasgow, Portsmouth, Preston, Sligo, Southampton, Swansea, Waterford, Wexford, and Whitehaven: or in original packages of less than 80 pounds weight. Passengers, however, may pay duty on any quantity of manufactured tobacco or cigars under 3 pounds, if from the continent, and any quantity not exceeding 7 pounds if from the East and West Indies, and other distant voyages; and of manufactured tobacco, passengers may pay duty, and import as surplus stores any quantity not exceeding 9 pounds. Of cigars unconsumed on the passage, the passenger is only allowed 8 ounces free of duty. The penalties for any evasion of these regulations are very heavy.

In the United States the tobacco-culture enters largely into the agricultural industry—the annual amount raised being about 270,000,000 pounds. According to the census returns of 1870, the yield in several of the principal tobacco-growing states was as follows, in pounds: Alabama, 152,742; Arkansas, 594,886; California, 63,809; Connecticut, 8,328,798; Florida, 157,405; Georgia, 288,596; Illinois, 5,249,274; Indiana, 9,325,392; Iowa, 71,792; Kansas, 33,241; Kentucky, 105,305,869; Maryland, 15,785,339; Massachusetts, 7,312,885; Mississippi, 61,012; Missouri, 12,320,483; New Hampshire, 155,344; New Jersey, 40,871; New York, 2,349,798; North Carolina, 11,150,087; Ohio, 18,741,973; Pennsylvania, 3,467,539; South Carolina, 34,805; Tennessee, 21,465,452; Texas, 59,706; Vermont, 72,671; Virginia, 37,086,364; West Virginia, 2,046,452; Wisconsin, 760,813.

Under the existing United States revenue laws the duties upon cigars, cigarettes, and cheroots are $2 50 per lb., and an additional internal revenue tax upon cigars and cheroots of $5 per thousand. Cigarettes weighing over 3 lbs. per thousand have a tax of $5 per thousand; under 3 lbs. per thousand, the tax is $1 50.

Other manufactured tobaccos are subject to 50 cents per lb. duties and an internal revenue tax of 20 cents per lb. The duty on unmanufactured tobacco in leaf is 35 cents per lb.; stems, 15 cents per lb.

Tobacco-leaves, when submitted to chemical analysis, yield Nicotine (q. v.), which is its most characteristic constituent, albumen, a gluten-like substance, gum, resin, malic and citric acids, and a large amount of inorganic constituents, 100 parts of the dry leaf yielding from about 19 to 27 per cent. of ash, in which potash, lime, and silica preponderate. In a physiological and medical point of view, the analysis of the smoke of tobacco is of far more importance than that of the leaf. From the researches of Dr Richardson, it appears that although 'the widest differences prevail in respect to the products arising from differing cigars, differing kinds of tobacco, and differing pipes,' there are certain substances which are common to all varieties of tobacco-smoke. Firstly, there is in all tobacco-smoke a certain amount of *watery vapour*, impregnated with various substances, from which it may be separated. Secondly, a small quantity of free *carbon* is always present; it is to the presence of this constituent that the blue colour of the smoke is due. 'It is this carbon,' says Dr Richardson, 'which in confirmed and inveterate smokers settles on the back part of the throat and on the lining membrane of the bronchial tubes, creating often a copious secretion, which it discolours, and which is coughed up of a dark coaly appearance.'—*For and Against Tobacco*, Lond. 1865, p. 5. Thirdly, there is a certain quantity of *ammonia* present. The presence of the ammonia gives to the smoke an alkaline reaction. Moreover, 'it is the ammonia that bites the tongue after long smoking; it is the ammonia that makes the tongue and throat of the smoker so dry, and induces him to quaff as he smokes, and that partly excites the salivary glands to secrete so freely. The ammonia also exerts an influence on the blood.'—Richardson, *op. cit.*, p. 6. Fourthly, *carbonic acid* is always present, as may be shewn by its action on lime-water. The amount differs extremely in the smoke from different kinds of tobacco, but, according to Dr Richardson, it may be fairly inferred that the sleepiness, headache

and lassitude which follow the prolonged inhalation of tobacco-fumes, are largely due to this agent. Fifthly, tobacco-smoke yields a *product having an oily appearance*, and possessing poisonous properties. It is popularly known as *oil of tobacco;* and on further analysis, it is found to contain three substances—viz., a fluid alkaloid, *nicotine;* a *volatile substance* having an empyreumatic odour; and an *extract* of a dark resinous character, having a bitter taste. The symptoms of tremor, palpitation, and paralysis which ensue after excessive smoking, especially in persons unaccustomed to indulgence in this practice, seem to depend upon the nicotine, which is known, by experiment, to be highly poisonous. 'The peculiar smell of stale tobacco-smoke, which hangs so long on the breath of the smoker, and on articles of clothing, is derived from the volatile empyreumatic substance; and the exceedingly nauseous sharp taste which is recognised by every unpractised smoker, when he takes a foul pipe into his mouth, is due to the bitter extract. It is apparently this extract which creates vomiting in persons unaccustomed to tobacco, and of which the body after a time becomes tolerant.'—Richardson, *op. cit.*, p. 8. Hence it appears that the more common effects are due to the carbonic acid and the ammonia; while the rarer and more severe are due to the nicotine, the empyreumatic substance, and the resin.

It is unnecessary to enter into details regarding the symptoms of slight tobacco-poisoning, because they are well known to the great majority of the male population. Fortunately, the effects produced by tobacco are very transitory, as the poison finds a ready exit from the body. The system, after being subjected for a few times to the poisons of tobacco-smoke, becomes accustomed to their influence, the distressing symptoms no longer occur, and a condition of 'tolerance' is established. From the extensive investigations of Dr Richardson, it appears that there are no grounds for believing that smoking can produce any organic changes. It may, however, produce various functional disturbances: (*a*) On the stomach. (*b*) On the heart, producing debility and irregular action. (*c*) On the organs of the senses, as dilatation of the pupil, confusion of vision, subjective sounds, &c. (*d*) On the brain, suspending the waste of that organ, and oppressing it if it be duly nourished, but soothing it if it be exhausted. (*e*) On the nerves, leading to over-secretion of the glands which they control. (*f*) On the mucous membrane of the mouth, causing what has been described as the 'smoker's sore throat.' 'The disease consists of an irritable state of the mucous membrane at the back of the throat, redness there, dryness, a tendency to cough, and an enlarged soft, sore condition of the tonsils, rendering every act of swallowing painful and difficult.' It may exist without detection for a long time; but if a damp, cold, foggy state of the air comes on, the throat becomes troublesome and painful, enlargement of the tonsils is detected, and the symptoms become much aggravated by any attempt to smoke. This condition is more readily induced by the use of cigars than of pipes; it is quite incurable so long as the patient continues to smoke, but soon disappears when the use of tobacco is entirely suspended. In association with this condition of the throat, the gums are usually abnormally pale and firm. (*g*) On the bronchial surface of the lungs, sustaining any irritation that may be present, and increasing the cough. There is no evidence that tobacco-smoke can cause specific diseases, such as insanity, epilepsy, St Vitus's dance, apoplexy, organic disease of the heart, cancer, consumption, or chronic bronchitis. If, as is universally allowed, tobacco possesses, like alcohol, arsenic (in minute doses), opium, tea, coffee, &c., the power of arresting the oxidation of the living tissues, and thus checking their disintegration, it follows (1) that the habit of smoking must be 'most deleterious to the young, causing in them impairment of growth, premature manhood, and physical degradation' (Richardson, *op. cit.*, p. 73); and (2) that the habit may be conducive to the physical well-being of the individual, provided he cannot supply himself with sufficient nourishing food to supply the daily tear and wear of the muscular and nervous systems.

For a long controversy on the question, *Is Smoking Injurious to Health?* in which Sir Ranald Martin, Mr Solly, Dr Ranking, and other medical men took a part, the reader is referred to the 1st volume of *The Lancet* for 1857. The whole matter is very fairly summed up by Dr Richardson in the excellent pamphlet from which we have so freely borrowed in this article—a memoir which we can cordially recommend to all who take an interest in this subject. Before the full maturity of the system is attained, even the smallest amount of smoking is hurtful; subsequently, the habit is, in most instances, only prejudicial when it is carried to excess. We cannot honestly say more against tobacco than can be urged against any other luxury, and of nearly every luxury it is the least injurious. 'It is innocuous as compared with alcohol; it does infinitely less harm than opium; it is in no sense worse than tea; and by the side of high living altogether, it contrasts most favourably.'—Richardson, *op. cit.*, p. 75. In conclusion, a word or two may be said regarding the kind of pipe that should be used. A long, perfectly clean pipe, composed of an absorbing material like clay or meerschaum, which can suck up the oily matter before it reaches the mouth, is always to be preferred; and M. Melsens, to whom the scientific world is indebted for many ingenious applications of chemistry to hygiene and the treatment of diseases, has recently suggested, that if a plug of cotton, saturated with a strong solution of citric or tannic acid, were placed in the stem, so as to filter the smoke before it reached the mouth, all the nicotine would be seized by and combine with the acid. The different kinds of tobacco exert a different influence on the smoker according to the amount of noxious ingredients which they contain. Thus, cavendish, pigtail, and coarse shag yield the oily matters in much more abundance than Latakia or Turkish, which are hence termed mild tobaccos. Cigars produce dyspepsia much more rapidly than pipes, for in smoking them, unless with a long mouth-piece, nicotine is necessarily absorbed.

Snuffing is probably the least injurious form in which to take tobacco, and chewing the most deleterious; yet sailors, who chew more freely than any other class in this country, are usually men in vigorous health, and after prolonged practice, the quantity they can consume is enormous. Dr Arrott mentions the case of a harbour-superintendent, formerly a sailor, aged 64, in the almost uninterrupted enjoyment of good health, who has chewed tobacco for upwards of 50 years, and now also *eats* it, swallowing every particle of leaf and juice. For many years, he has been in the constant practice of 'eating a quarter of a pound of the strongest negrohead every five days.'—*The Lancet*, 1847, vol. i. p. 440.

The effects which tobacco produces in large doses, when taken by persons unaccustomed to its use, in the form of powder, infusion, or excessive smoking, are 'faintness, nausea, vomiting, giddiness, delirium, loss of power of the limbs, general relaxation of the

muscular system, trembling, complete prostration of strength, coldness of the surface, with cold, clammy perspiration, convulsive movements, paralysis, and death. In some cases, there is purging, with violent pain in the abdomen; in others, there is rather a sense of sinking or depression in the region of the heart, creating a sense of impending dissolution. With the above-mentioned symptoms, there is a dilatation of the pupils, dimness of the sight, a small, weak, and scarcely perceptible pulse, and difficulty of breathing.'—Taylor's *Principles and Practice of Medical Jurisprudence*, p. 321. Although there are two recorded cases of poisoning by nicotine, poisoning by tobacco has rarely given rise to medico-legal investigation. There is, however, reason to believe that porter is often drugged with tobacco or Scotch snuff, for the purpose of stupefying persons with a view to robbery. In all cases of poisoning with tobacco, if it has been swallowed, an emetic of a scruple of sulphate of zinc should be at once administered, and the most powerful stimulants, both external and internal, should be employed. Professor Haughton has shewn that nicotine and strychnine antagonise one another; on this assumption, strychnine, carefully administered, would be the proper antidote.

Tobacco has been used in medicine in the form of an enema, with the view of relaxing the muscular fibres, in cases of strangulated hernia, stricture of the bowel or urethra, tetanus, &c.; but in such cases, it has now been generally superseded by chloroform. If it continue to hold a place in the Pharmacopœia, it will probably be as an antidote to strychnine.

It must be recollected that *Indian Tobacco* has nothing in common with the subject of this article, and is a synonym for *Lobelia inflata*.

TOBACCO-PIPES are made of various materials, the commonest in Europe being a fine white clay, which has consequently received the name of *pipe-clay*. Their usual form is too well known to need description, but the manufacture of a clay tobacco-pipe is by no means a simple affair. The first part of the operation is performed by trained children, who, with nice skill, roll out upon a board a small piece of clay into a long slender cylindrical rod, at the end of which is then attached a lump of clay, just enough to form the bowl. These rudimentary pipes are arranged by dozens on a board, until they have become sufficiently hardened. They are then handed to the pipe-maker, who takes a pointed iron wire, and first dipping it into oil, pushes it into the end of the thin column of clay, and having passed it through, forms the bowl with a folding brass mould. The wire is then withdrawn; and after a slight dressing with a knife, the pipes, now complete, are slightly curved in the stem, and are laid by to dry for a few days, when they are removed to the kiln, which is of a peculiar construction, and consists of an interior chamber, with a number of small stages, so that the pipes can be conveniently arranged in circles without touching each other. This interior chamber can be closed so as to exclude smoke, and, in fact, is only a *seggar* on a large scale, such as is used in making Pottery (q. v.). The fire acts all round it, and fires or burns the pipes without smoking them. When thoroughly baked, they undergo a kind of polishing or dressing, and are fit for sale. Finer and more expensive pipes are made of Meerschaum (q. v.). Under the head of PIPE-STICKS will be found an account of the various materials used for making the tubes of these and other pipe-bowls. *Brier-root pipes*, now very common, have the bowl and stem made of one piece of wood; and although the stem is short, they partially absorb the oil produced in smoking, which, however, is perhaps as much the case with the common clay-pipe when it is new.

Various opinions have been entertained as to the antiquity of the practice of smoking, and consequently of the use of pipes. That pipes for smoking herbs for medicinal and other purposes were in use in England and elsewhere long before the introduction of tobacco, is tolerably certain, and the custom is still prevalent in some places. Colt's-foot, yarrow, mouse-ear, lettuce, and other plants are occasionally smoked, and no doubt have been so for centuries. A primitive kind of pipe, doubtless such as has been made generation after generation, is still in use in some remote districts. It consists of a stick of elder, from which the pith has been removed, with a bowl formed of common clay, and dried by the kitchen-fire. However much the habit of smoking herbs might obtain in Britain before that time, it is certain that to the introduction of tobacco is to be traced the rise of the trade of the pipe-maker. Pipes have been found in situations near the Roman wall in Northumberland, and other Roman stations in Britain, suggesting the idea that they were used by the Roman soldiers. But this opinion was relinquished by Dr Bruce, the antiquary, who first propounded it; and very few now imagine that any of the pipes to be seen in the antiquarian museums of Europe are many centuries old. The names Danes' Pipes, Celts' Pipes, Elfin Pipes, Fairy Pipes, Old Man Pipes, &c., are popularly given to these old pipes, but afford no evidence as to their real antiquity. Many of them are remarkable for their very small size, whence, perhaps, some of the names; but this is easily accounted for by the consideration of the very high price of tobacco when first introduced into Europe, and the manner in which it was used, the smoke inhaled by the mouth being expelled through the nostrils, so that the narcotic power of the herb was enjoyed to the utmost. Similar very small pipes have also been found in North America, and the same mode of using tobacco has always prevailed amongst the American Indians. See Wilson's *Prehistoric Man*, vol. ii. Stone pipes, or pipe-bowls, have also been found in Britain, cut in rude forms, and which apparently were used by the insertion of a tube, perhaps a straw. Such pipe-bowls, but elaborately carved, are amongst the most remarkable American antiquities. They continue, however, to be made by the American Indians to the present day, often of stones, which are not cut without great difficulty, and are adorned with figures of men and animals. Some of them are adapted for the insertion of two tubes, that two smokers may inhale the fumes of the tobacco at once. Among some of the American tribes, the greatest care is bestowed on the ornamenting of the pipe-stem; by others, on the bowl.

The clay-pipe, much the same as is now used, probably came into use very soon after the introduction of tobacco in Britain. Aubrey, writing in 1680, says that tobacco-smokers at first used silver pipes, 'but the ordinary sort made use of a walnut-shell and a straw.' In the reign of William III., pipes were occasionally made of brass and of iron. Examples of these are preserved in various collections. The pipe was, in the earlier days of smoking, passed round the table—one man taking a whiff or two, and then handing it to his neighbour; thus, one pipe of tobacco would 'suffice three or four men at once.' The annexed cut (fig. 1) represents one of the earliest forms of the clay-pipe, undoubtedly of the

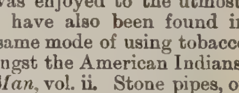


Fig. 1.—Pipe of the time of Queen Elizabeth.

Elizabethan period. It has been supposed by some writers that the smaller the pipe, the more ancient is its date; but this is decidedly an error. The better criterion of age is the *form*, and the following examples will shew the most prevalent shapes at different periods. The barrel-shaped bowl was most usual during the Commonwealth and the reign of Charles II., although it was made in many various shapes, which are well known from representations of them in prints of the time and on traders' tokens. The annexed cut (fig. 2) represents English tobacco-pipes of the 17th century. In the reign of William III., a more elongated form of

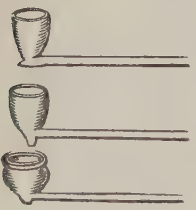


Fig. 2.

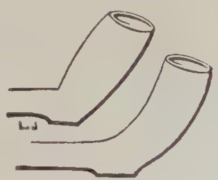


Fig. 3.

bowl (fig. 3) began to be prevalent, probably introduced from Holland, although the barrel-shaped bowl still continued to be used. In the middle of the 18th c., the wide-mouthed bowl, now so universal, became the prevalent form, and the spur, which had hitherto been flat, to rest the pipe upon when in use, was elongated, after a fashion supposed also to have originated in Holland. The Scottish *cutty-pipe* and Irish *dudeen* are short clay-pipes.

The most celebrated seat of the pipe-manufacture in Britain is Broseley, in Shropshire, where it appears to have been established in the middle of the 16th c., and has continued uninterruptedly to the present day. Many hands are employed, and many gross of pipes 'turned out' daily. Pipes are, however, made in many places, the clay being obtained from Purbeck.

The pipe-makers of London, as early as 1601, had privileges which gave them a monopoly. In 1619, the craft of pipe-makers was incorporated in England. Holland has long been famous for pipe-making. The Dutch manufacturers were very jealous of rivalry. In the middle of last century, a pipe-manufactory was established in Flanders, and the Dutch makers determined to ruin it. The duties were too high to admit of a large importation, and they therefore freighted a large ship entirely with tobacco-pipes, set sail to Ostend, and purposely wrecked her there. In accordance with the maritime laws of that city, the pipes were landed from the wreck, and sold at such 'ruinous prices' as defied competition; and the new manufactory at once sunk, and was closed.

TOBA'GO, one of the Windward Islands (see ANTILLES) belonging to Britain, lies 60 miles south-east of Grenada, and 18 miles north-east of Trinidad, is 32 miles long, from 6 to 9 broad, and has an area of 97 sq. miles. The island was discovered by Columbus in 1498, and named by him Assumption; the name of T. is supposed to have arisen from the free use of tobacco by the Caribs when first visited by Europeans. It came into British possession in 1764. From its gloomy-looking mountains, dense forests, and abrupt precipices, descending to the sea, T. has been called the 'Melancholy Isle;' but, on a nearer approach, the aspect becomes more pleasing, though still rough and irregular, being extensively occupied with conical hills and spurs, all connected by a ridge running through the interior, the greatest elevation of which is 1800 feet above the level of the sea. From the high ridge descend deep and narrow ravines, which terminate in small alluvial plains. Scarborough is its chief town, pleasantly situated on the shores of Rochley Bay, and at the base of a conical hill rising 422 feet in altitude, crowned by Fort King George. Plymouth, another town, is situated opposite Scarborough, on the lee ward shore, about six miles distant, and is the landing-place for passengers, &c. from the royal mail steamers. Two-thirds of the island is still covered with primitive forests, comprising many varieties of hard-woods and ornamental trees. The geological formation of the island is, on the whole, similar to that of Trinidad. The climate is considered salubrious; the thermometer ranges from 75° to 90°. The pop. in 1870 was 17,304. The island produces sugar, rum, molasses, cocoa-nuts, cotton, coffee, and indigo; pimento also grows wild. The quantity of sugar exported for the ten years preceding 1862, averaged 58,598 cwts.; shewing an increase of 3092 cwts. over the average of the preceding ten years, although labour had been scarce and difficult to obtain. There had been an increase in the number of public schools; and in 1862, 12⅗ of the population were receiving education; a much higher average than in the other West India Islands. The island is governed by a lieutenant-governor, under the governor of Barbadoes as chief.

TOBERMO'RY. See MULL, ISLAND OF.

TOBIT, BOOK OF, one of the most curious and interesting of the Old Testament apocryphal books. It exists at present in Greek, Latin, Syriac, and Hebrew MSS., the texts of which differ considerably, yet not materially, from each other. The oldest and most valuable is the Greek Septuagint; indeed, where the others depart from it, they possess little claim to our respect, although the *original* text was certainly not Greek. When and where the book was written, are questions to which various answers have been given; but the opinion of Ewald, who selects Persia as the scene, and the middle of the 4th c. B.C. as the date of its composition, agrees best with its internal character. The author he imagines to have been a Palestinian Jew who wrote in Hebrew, and conjectures that a translation of the work was made into Alexandrian Greek in the 1st c. B.C. That the contents of Tobit are not historical, scarcely requires proof in modern times; yet up to the period of the Reformation, no serious difficulty was felt in receiving it as such. Luther was the first to speak of it as a 'poetical,' i. e., an imaginary, didactic production; and since his time, biblical critics have been pretty unanimous on the point; although some contend for what they call a historical basis. The leading incidents of the story do not differ by a hairbreadth in grotesque and puerile *miraculousness* from the fantastic extravaganzas of the Arabian Nights. Tobit, sleeping outside the wall of his courtyard one night, is blinded by sparrows 'muting warm dung into his eyes;' his son Tobias is attacked on the Tigris by a fish, which leaps out of the water to assail him; and marries a Jewish maiden called Sara, seven of whose betrothed lovers had been successively carried off by an evil spirit called Asmodeus. Asmodeus is driven off by an angel—who first appears under the name of Azarias, but subsequently turns out to be Raphael—and then flies to the uppermost parts of Egypt, where he is bound. Old Tobit is cured of blindness by an application to his eyes of the gall of the fish that had tried to devour his son. The sentiments are often very pious and didactic, the descriptions of social life are picturesque, and apparently

true, but no excellence of that kind can reconcile us to the childish absurdities of the story.

TOBO'LSK, a government of West Siberia, occupies the north-west angle of the country, and is bounded on the N. by the Arctic Ocean, on the W. by the Ural Mountains, and on the E. by the governments of Yeniseisk and Tomsk. Area, 564,825 sq. m.; pop. (1867) 1,105,855, mostly Russians, but including also Ostiaks, Tartars, Bokharians, and Samoiedes. Branches of the Ural and Altaï Mountains form a hilly region in the west and south-east; but the government is for the most part an extensive plain, sloping to the banks of the principal rivers and to the shores of the Arctic Ocean. The chief rivers are the Ob (q. v.), and its great navigable affluents, the Irtish, Tobol, Om, and Toura. The soil is fertile in the southern and middle districts; marshes covered with forests occupy the land north of lat. 57°, and frozen marshes border the Arctic Ocean. See TUNDRAS. The climate, mild in the middle districts, is severe in the north, and warm in the south. Dogs, martens, ermines, silver and blue foxes, bears, deer, &c., eider-ducks, geese, ducks, &c., are the principal animals. The chief crops are rye, oats, and barley. Agriculture employs the great mass of the inhabitants, except in the north, where hunting and fishing are the general occupations. The luxuriant meadows of the south are taken advantage of for cattle-breeding. Timber, furs, and fish are the chief articles of commerce.

TOBOLSK, a town of Western Siberia, capital of the government of the same name, stands at the confluence of the Irtish and the Tobol, 1976 miles east of St Petersburg. It is well built, with timber houses and wide and regular streets, and its position on the two great rivers is picturesque; but its lower part is subject almost annually to inundation from the high floods of the Irtish in spring. Its situation, considerably north of the great commercial highway between Russia and Siberia, and at a distance from the more productive regions of the country, is unfavourable for the development of commerce. T. contains a large prison, capable of accommodating 3000 prisoners; and the convicts condemned to exile in Siberia are first assembled at this town, and thence deported to various parts of the country. Several regiments are stationed here. Pop. (1867) 20,330.

TOCANTI'NS, an important river of Brazil, South America, rises in the province of Gojas, flows north through the province of Para, and joins the waters of the Para (q. v.), the southern branch of the estuary of the Amazon, 130 miles from the Atlantic. Its principal affluent is the Araguay, which joins it in lat. 6° S., and has a longer course, and bears along a greater volume of water than the stream to which it is tributary. The T., at its junction with the Araguay, is 5500 feet wide; at its mouth, it is 8 miles wide. Total length, 1100 miles. The navigation, which is carried on by trading-boats resembling floating houses, is dangerous, on account of the numerous falls, sandbanks, and rapids. Boats descend from Porto Imperial (lat. 10° 30′ S.) to the mouth of the T. in from 20 to 30 days; the upward voyage to the same port occupies from four to five months.

TOCHER, in the Law of Scotland, is an ancient name for the marriage-portion given by a father on the marriage of his daughter. It is settled according to the wish of the father, or as may be agreed with the intended husband of the daughter. Where the father by will leaves a legacy to his daughter, and afterwards during his lifetime gives her a like sum as a tocher, this is not presumed to be a satisfaction of the legacy, though it is otherwise in England. See MARRIAGE.

TOCQUEVILLE, ALEXIS CHARLES HENRI CLEREL DE, a French statesman, and the most eminent writer of this century on the science of politics, was born at Verneuil, in the department of Seine-et-Oise, 29th July 1805. His father was the representative of an old family, the Clerels, proprietors of Tocqueville in Normandy. The Clerels, although in the direct line *noblesse d'épée*, had been closely connected with the magistracy, and, indeed, might be considered to belong more properly to that order, which in France has produced so many distinguished men. The mother of De T. was a grand-daughter of Malesherbes, the academician, political writer, and magistrate, who defended Louis XVI. at the bar of the Convention, and whose fearless intrepidity was punished by the execution of himself and all the most distinguished of his relations. Madame de Tocqueville and her husband narrowly escaped the guillotine by the fall of Robespierre; but they did not emigrate, like other royalist families, and they preserved their property. At the Restoration in 1815, the father of De T. reassumed the title of Count, which belonged to the family before the Revolution. Young T. was called to the bar at Paris in 1825; and after a short tour in Italy, entered the magistracy as *juge auditeur* at Versailles. In this situation, he carefully studied the administrative system of France; and struck by the perpetual recurrence of revolution, devoted much thought to political questions. In 1831, he threw up his appointment at Versailles, and with his colleague there, M. Gustave de Beaumont, accepted a government mission to America, to report on the working of the penitentiary system. The commissioners, after remaining a year and a half in the United States, returned to Europe, and published their Report (*Du Système pénitentiaire aux Etats-Unis*, 1832; Eng. transl., Philadelphia, 1833)—an admirable work, which modified all the ideas previously entertained in France regarding prison-discipline. But this was not the most important result of their inquiries. In 1835, De T. published his great work, *De la Démocratie en Amérique*. In his introduction, he sought to shew that a great democratic revolution has for centuries being going on in Europe. There is a general progress towards social equality, which must be looked on as a providential fact. In France, it has always been borne on by chance, the intelligent and moral classes of the nation never having connected themselves with it, in order to guide it. In America, he found that the same revolution has been going on more rapidly than in Europe, and has indeed nearly reached its limit in the absolute equality of conditions. There, accordingly, he thinks we may see what is about to happen in Europe. He points out that the people in America may be strictly said to govern. They make the laws and administer them. He draws from what he has observed the conclusion, that democracy may be reconciled with respect for property, deference for rights, safety to freedom, and reverence for religion. He does not propose the laws and manners of the Americans for the imitation of other democratic peoples. He merely seeks, by a faithful picture of an existing democracy, to allay the dread of democratic progress, and to induce those at the head of affairs to recognise it as irresistible, and to seek to control it by wise concessions. *The Democracy* made at once a great sensation. The accuracy of the statements, the skill with which the matter had been digested, and the beauty of the style, were loudly praised by critics. The author was described as the continuator

of Montesquieu, and the greatest political writer of his time. He became successively a member of the Academy of Moral Sciences, and of the French Academy. In 1835, De T. visited England, where his work had made him known, and where he received an enthusiastic welcome from the leaders of the Whig party. In the same year, he married Miss Mottley, an Englishwoman. He shortly afterwards, by a family arrangement, entered into possession of Tocqueville. He stood, in 1837, as candidate for the representation of Valognes in the Chamber of Deputies. His opponent was a retired mill-spinner, who raised the cry of 'No nobles' against him. Alluding to the great dovecot of Tocqueville, his opponent said: 'Prenez garde! Il va vous remener les pigeons.' De T. was defeated; but two years after, he had become a great favourite with his neighbours, the Norman farmers, and they returned him to the Chambers by an overwhelming majority. As a speaker, De T. did not succeed, but he exercised great influence on the legislature. Immediately after the revolution, he was the most formidable opponent of the Socialists and extreme Republicans. He opposed Louis Napoleon, as a man who believed in his right to the throne as firmly as Charles X. He became, however, in 1849, Vice-president of the Assembly; and from June to October in the same year, Minister of Foreign Affairs. At this time, he vindicated the policy of the expedition to Rome, on the ground, it must not be forgotten, that it would secure liberal institutions to the States of the Church. After the *coup d'état*, he returned to Tocqueville, where he devoted himself to agricultural pursuits. He there wrote *L'ancien Régime et la Révolution* (Par. 1856; Eng. transl., New York, 1856), a work worthy of his fame. In June 1858, he broke a blood-vessel, and was obliged to leave the bleak coast of Normandy for a warmer climate. He took up his abode at Cannes, where Lord Brougham and Chevalier Bunsen spared no effort to soothe his lingering illness. He died there, 16th April 1859. T.'s *Œuvres et Correspondance Inédites* were published in 2 vols. (1860), by his friend M. de Beaumont, who prefixed a biographical notice. The Eng. transl. of this work appeared at London and New York in 1861.

TOD (derivation unknown), a weight for wool, now unused; it was fixed at 28 lbs. avoirdupois in 1671.

TODARS, TODAWARS, or TUDAS,* a remarkable race inhabiting the upper part of the Neilgherry Mountains (q. v.), in Southern Hindustan. They are rapidly diminishing in number, chiefly owing to the practice of Polyandry (q. v.), and their not allowing intermixture with other races; in 1858, it appears that only 337 were left. They are tall, well proportioned, and athletic, with finely moulded limbs, and bold, independent carriage; the nose aquiline, with black, bushy hair and beard. The dress of the men consists of a single toga, worn so as to leave the right arm free, not unlike the plaid of the Scottish Highlander. Both sexes are of a dull copper colour but the women are rather fairer than the men, and are often tall and handsome in feature and person. They have no occupation except tending their herds of buffaloes, and converting the milk into butter. The buffalo, indeed, is so important to them, that they look on the pen where the herd is cooped up at night with superstitious veneration. They never attempt the cultivation of the land around them, as they obtain what grain they require from the Burghers and other agricultural tribes, who pay it in the shape of tribute (*goodoo*) for the lands they cultivate, over which the T. assert an imaginary right. The T. hold that their ancestors were the aboriginal inhabitants of these regions (see INDIA, *Inhabitants*); that the Kothers, and afterwards the Burghers, came among them; and that they allowed these tribes to cultivate land on condition of paying a goodoo of one-sixth of the harvest. The Burghers continue to pay this tribute of grain, but only in such amount as suits their own wants and inclinations, and rather in the shape of charity than otherwise. The only use the T. get of the buffalos, besides their milk, is to furnish sacrifices to the manes of the dead. They are wont to salute the sun at his rising and setting, and believe that the soul after death goes to the 'great country.' They have no distinct places of worship, except the hut in which they keep their milk, where they pour out in libations to their deities what remains after their daily consumption. They have never been known to steal the smallest article. No civil servant, or native of any of the other tribes, has ever been able to acquire their language, which has no written character, and not the slightest affinity with Sanscrit. Their mode of collecting the goodoo is singular enough: 'As soon as harvest is over, and the goodoo collected in Todanaad, the Toda men of that division pay visits to the munds (villages, or groups of huts) in Meyleanaad and Paranganaad, and take up their abode with the women of the community (to the temporary exclusion, as is the custom, of the legitimate husband). They then pay visits to the surrounding Burgher villages, and demand in their right, as temporary husbands of the women of the naad, the goodoo, which, strange to say, is paid; and thus the same man, perhaps, who has laid a whole village in his own naad under contribution, goes the round of the other two naads, appropriating the fruits of the Burghers' labour and industry, and carrying off enough grain to support his whole community in idleness and plenty until the arrival of the next year's harvest-time, and to produce by sale in the nearest bazaar sufficient money to pay the tax which is levied yearly on their tribe. I should have refused credence to such a statement, had I not received it on the best authority, that of the tahsildar of the district.'—See *Statistical Memoir of a Survey of the Neilgherry Mountains*, laid before the Select Committee on Colonisation, &c., in 1858, ordered by the House of Commons to be reprinted, 1861; Captain Harkness's *Description of a Singular Aboriginal Race*, &c., 1832; Captain Burton's *Goa and the Blue Mountains*, 1861.

* 'Written also *Toda, Thoda, Thodawur.* The name of a pastoral people inhabiting the Nilghiri Mountains, and claiming to be the original occupants and proprietors of the whole of the hilly country.'—Dr H. H. Wilson's *Glossary of Indian Words.*

TODDY, the name given in the East Indies to the fermented juice of various palms from which Arrack (q. v.) is distilled. The name has been adopted in Britain for a mixture of whisky, sugar, and hot water, which forms the national drink of Scotland and Ireland. See SPIRIT.

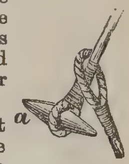
TODLEBEN, FRANZ EDWARD, Russian general of Engineers, was born at Mitau, Russian province of Courland, in 1818. After studying at Riga, he was admitted as a student in the College of Engineers at St Petersburg. He was second-captain in the engineer corps when the Russian army entered the Danubian Principalities in 1853, and served in the campaign of the Danube under General Schilders. His genius as a military engineer was discovered before the Russian army crossed the Pruth, on its retreat from the Principalities; and when the French and English troops undertook the siege of Sebastopol, Colonel T. was sent to assist in

its defence. It was in the middle of April when he arrived, and the fortifications were soon placed under his direction. The principle on which he acted was to watch the works of the allies, and to establish against them on every point a superiority of fire, by multiplying the number and increasing the calibre of his guns. The prodigious activity displayed by the Russians in making good the damage sustained by the heavy fire of the enemy, filled the allied army with astonishment. Everywhere, massive ramparts of earthworks, mounted with formidable batteries, rose up as if by magic at each threatened point within the line of defence. According to T., the defence was rapidly asserting an engineering superiority over the attack. The Malakoff, however, was carried by assault, and the allies entered Sebastopol (see *History of the Russian War* (illustrated), W. & R. Chambers). At the battle of Inkermann, T., who was on the spot by chance, seeing that the Russian artillery was in danger of being taken, promptly halted a regiment, caused four guns to open fire on the allies, and gave time to the artillery to retreat. At the latter part of the siege, he was wounded in the leg, but all his great defences had then been completed. Since the conclusion of peace, he has expanded what was at first a mere engineer's report into a history of the war in the Crimea. It is entitled *Défense de Sebastopol: ouvrage rédigé sous la Direction de Lt.-Gen. E. de Todleben, aide-de-camp général de S.M. l'Empereur.* In this work, he writes a thoroughly Russian account of the Crimean War. In all that relates to the Russian army and its labours, and especially in regard to the work of the siege, the author may be accepted as an unimpeachable authority; but where the British and French armies are concerned, he is too often careless and inexact, and sometimes his statements are absolutely untrue. For his pre-eminent services in the siege, he was rewarded with the rank of General of Engineers, and decorated with the clasps of the order of St George. [Died in 1884.]

TO'FFEE, or TOFFY, a sweetmeat made of sugar, melted with about half its weight of butter. Much care is required in making it, to insure its being crisp when cold. It should be kept over the fire and slightly simmered for a quarter of an hour, when small drops are taken and let fall on a marble slab to cool quickly for trial; if they become brittle, it is complete. Everton, near Liverpool, has a name for its toffee.


Roman Toga.

TO'GA (from Lat. *tego*, to cover) was the principal outer garment of the Romans, and originally, perhaps, the only one. Subsequently, an under-garment, the *tunic*, was added. It was probably of Etruscan origin, and yet it came to be considered the distinctive badge of the Roman citizen, whence the Roman people are called *togati*, or *gens togata;* and consequently, when the Cisalpine Gauls received the rights of citizenship, their country was spoken of as *Gallia togata*, in opposition to Transalpine Gaul, or *Gallia braccata* (breeched). At first, it was apparently semicircular in shape—so, at least, say Dionysius, Quintilian, and others—but afterwards, when it came to be an elaborate and complicated dress, it must have been a smaller segment than a semicircle. The mode of wearing the toga is difficult to describe, and required considerable art to make the folds fall gracefully. The toga was made of woollen cloth, and except in the case of mourners, was of a white colour. Accused persons sought to excite sympathy by going about in a soiled (*sordida*) and unsightly toga; while those who were seeking office were wont to dress themselves out in garments which had been made artificially bright by the help of chalk, hence their name of *Candidati* (lit. shining ones), candidates. The *toga prætexta* had a broad purple border, and was worn by children, and most though not all of the magistrates. The *toga picta*, so called from being ornamented with embroidery, was worn by generals when enjoying their 'triumphs.' Under the emperors, the toga, as an article of common wear, fell into disuse, the Greek *pallium* and other garments being used instead; but it continued to be used by officials on solemn or festive occasions.



Toggel.

TO'GGEL, on Shipboard, a short bar of hard wood, *a*, tapering from the middle towards each end, placed in an eye at the end of a rope, as a convenient obstacle to the rope passing through a loop or knot.

TO'GGENBURG, or TOCKENBURG, a district in Switzerland, within the canton of St Gall, formed by the long and fertile valley of the Thur. It was formerly governed by counts of its own, who ranked as the richest and most powerful land-proprietors in the country. On the extinction of their line in 1436, the possessions passed to the Barons of Rasen, who sold them in 1469 to the Abbot of St Gall. Since 1803, T. has formed part of the canton of that name. The valley is thickly peopled by an industrious race, who carry on the manufacture of muslin and cotton. The most interesting spot in the whole region is Wildhaus, in the Johannisthal, a little mountain village more than 2000 feet above the level of Lake Zürich, where Ulrich Zwingli, the Swiss reformer, was born.

TOISE, in the ancient French system of measures, was the unit of linear dimension, and was divided into 6 feet, each foot (*pied*) into 12 inches, and each inch (*pouce*) into 12 lines (*lignes* or *points*). It is equivalent to 1·94903659 French mètres, or to 6·3946 English feet.

TOKA'T, a town of Turkey in Asia, west from Trebizond, and 60 miles from the south shore of the Black Sea, stands at the mouth of a defile, on the banks of a small stream. It is enclosed by mountains on three sides, so that in summer the heat is intolerable. Gardens and vineyards extend along the slopes of the valley to the distance of three miles above the town. The town consists principally of wooden huts, disposed in narrow and dark streets. It was formerly a place of considerable trade, but its importance as a commercial mart has declined. Extensive copper-furnaces, however, in which copper ore, brought from near Diarbekir, by means of mules and camels, is smelted, still exist, and give employment to many persons. Cotton-printing and dyeing are also carried on. Pop. 35,000.

TOKA'Y, a species of wine obtained from the vines which grow on the Hegyallya Mountains, a group stretching north and north-east of Tokay

The T. wine-district comprises about 15,000 English imperial acres, the produce from the Mezes-mali, a detached rounded eminence near Tokay, being most esteemed. Great care is bestowed on the proper assortment of the grapes (which are never gathered till fully ripe); and also on the preparation of the wine—of which about 34 sorts are reckoned; but all of these may be grouped into the two classes of sweet and dry. The wine is brownish yellow while new, changing to a greenish hue as it grows older. The average annual produce of the T. vineyards is 1,500,000 imperial gallons of the dry, and 50,000 gallons of the sweet, wines. T. wine enjoys an immense reputation on the continent for its great restorative and tonic qualities; and so much is it esteemed in Hungary, that every considerable proprietor for miles round makes it a point to acquire some property in this vine-district, that he may be able to procure his wine from his own vineyards. On this account, genuine T. is obtainable by wine-merchants only in small quantity (and this is especially the case with the more valuable sort, the sweet or imperial T.), and is largely mixed with inferior wines, to increase the amount. The vine-gathering is celebrated at Tokay, Maad, and Tallya, the three chief places of the district, as a national fête, to which the magnates of Hungary with their families flock from all quarters; and during the season of festivity and rejoicing, many times more than the whole value of the vintage is expended. The crowd of visitors is swelled largely by the wine-dealers and medical agents, who eagerly buy up such lots as are for sale, and sometimes give the most extravagant prices for imperial or other good qualities of wine. Large quantities of 'imitation' T. are made by French and German chemists, and sent to all parts of Europe, not excepting Hungary itself, so that purchasers require to guard against imposition by dealing only with the grower or his accredited agent.

TOKEN, the name given to a kind of money which was at certain periods current in Britain by sufferance, and not by royal authority. Tokens first came into use in England in the reign of Henry VIII., in consequence of the want of any authorised coins

Fig. 1.—Token of the Triumph, or Pageant Tavern, Charing Cross, 1661.

to represent the fractions of a penny; and in the reign of Elizabeth, stamped tokens of lead, tin, and even leather, issued by vintners, grocers, and other

Fig. 2.—Token of the Mermaid Tavern, Cheapside, London, about beginning of 17th century.

tradesmen, passed largely from hand to hand, and were payable at the shops where they were issued. The corporations of Bristol, Oxford, and Worcester, had also their tokens. In 1613, a royal proclamation authorised Lord Harrington to issue farthing tokens, and prohibited the use of private tokens under penalties. This prohibition was renewed by Charles I., who granted to the Duchess of Richmond, Sir Francis Crane, and others, the exclusive right of coining authorised farthings for seventeen years; but the farthings made by these patentees were the subject of much discontent, as they were greatly below the intrinsic value of the metal. In the face of these prohibitions, private tokens, principally of brass, continued to circulate, and were especially abundant during the Civil War. Numerous tradesmen's tokens, mostly of copper, were again struck during the scarcity of money at the close of last century. On account of the scarcity of current silver money, previous to the new coinage of 1817, silver pieces known as Bank Tokens, of the respective values of 5*s.*, 3*s.*, and 1*s.* 6*d.*, were issued by the Bank of England: they were called in on the revision of the coinage.—See Chambers's *Book of Days*, vol. i. p. 535.

TOLAND, JOHN, a well-known deistical writer, of the 17th and 18th c., was born near the village of Redcastle, in the county of Londonderry, Ireland, November 30, 1669 (or 1670). His parents were Roman Catholics, and he was brought up in that religion. His baptismal name was James Junius; but the ridicule which it drew upon him at school, led him to change it into John, by which he is now known. He was educated at Redcastle, and entered the university of Glasgow in 1687, but removed to that of Edinburgh, where he took the degree of Master of Arts in 1690. Thence he passed to Leyden, where (having abandoned at Edinburgh the Roman Catholic faith) he entered upon theological studies with a view to orders as a nonconformist minister. One of his masters at Leyden was the celebrated Spanheim. He remained there about two years, during which time he made the acquaintance of Leibnitz and some other distinguished men; and on his return to England, he resided for some time at Oxford, where his extravagant vanity, and the reckless boldness of his opinions on religion, drew on him much notice. In the Bodleian Library, he collected the materials of more than one of his later publications, and prepared in great part the work entitled *Christianity not Mysterious*, which he published in London in 1696, and in which he fully avowed his unbelieving principles. The work created a great sensation in the theological world. It was censured by Convocation, and led to several replies (among which, those of Payne and Stillingfleet may be specially noticed); and in the following year, T. resolved to return to Ireland, sending before him a large number of copies of his work; but he was received no less unfavourably than in England, and his book was burned publicly by the common hangman, in virtue of an express vote of the Irish parliament. Finding it necessary to flee from Ireland, T. returned to London, where he published a defence against this judgment of the Irish parliament; but he soon afterwards turned his pen from theological to political and literary subjects. A pamphlet entitled *Anglia Libera*, on the succession of the House of Brunswick, led to his being received with favour by the Princess Sophia at the court of Hanover; and to his being sent on a kind of political mission to some of the German courts.

During his residence abroad, he published in 1702 a vindication of his book against the judgment of the Convocation, the tone of which was considerably more moderate; but again, in 1705, he outstripped the boldness of his former opinions, and with still less of disguise, openly avowing himself a

pantheist. In this course he was emboldened by the patronage of Harley, in whose service he had engaged as a political pamphleteer, and by whom he was sent abroad to Holland and Germany in 1707, in a capacity which, however he disavowed it, was plainly that of a political spy. He returned to England in 1710; and having forfeited the favour of his patron, or at least having separated from him, he engaged as a partisan pamphleteer on the side of Harley's adversaries.

His after-life was that of a literary adventurer, and was checkered by every variety of literary conflict and pecuniary struggle. It forms one of the most curious and painful chapters in D'Israeli's *Calamities of Authors.* He resided from the year 1718 at Putney, where he died, March 11, 1722, in his 52d or 53d year; and it is observed by Disraeli, that on his table was found an *Essay on Physic without Physicians*, which he was writing, in revenge for the unskilful treatment which he himself had suffered in his malady.

Of his works, which were very numerous, but have never been collected into a uniform edition, the following are the most remarkable: *Christianity not Mysterious: a treatise shewing that there is nothing in the Gospel contrary to Reason, nor above it* (Lond. 1696); *Apology for Mr Toland* (1697); *Life of Milton*, prefixed to Milton's works, 3 vols. folio (1698); *Anglia Libera, or the Limitation and Succession of the Crown explained and asserted* (1701); *Vindicus Liberius, or Mr Toland's Defence of Himself against the Lower House of Convocation* (1702); *Socinianism truly stated* (1705); *Reasons for naturalising the Jews* (1714); *State Anatomy of Great Britain* (1714); *Nazarenus, or Jewish, Gentile, or Mahometan Christianity* (1718). A detailed account of these works would be out of place, but they all exhibit in a general way the characteristics described above. His Posthumous Works were published in 2 vols. 8vo, in 1726, with a life by Des Maizeaux. An *Account of Toland's Life and Writings*, ascribed to Curle, had previously appeared in 1722. It should be added that the above list is far from containing all the writings of this now little known, but once active and notorious polemic.

TOLE'DO, a famous city of Spain, capital of the province of the same name, and long the capital of the whole country, stands on the north bank of the Tagus, by which it is encompassed on three sides, 55 miles south-south-west of Madrid by railway. It is situated on a number of hills at the height of about 2400 feet above sea-level; and the climate, excessively hot in summer, is bitterly cold in winter. The Tagus is the great fortress of the town. Rushing round it, on the east, south, and west, between high and rocky banks, it leaves only one approach on the land-side, which is defended by an inner and an outer wall, the former built by the Gothic king Wamba, in the 7th c.; the latter by Alfonso VI. in 1109, and both remarkable for the number and beauty of their towers and gates. Seen from a distance, the city has a most imposing appearance; within, it is gloomy, silent, inert, and its narrow streets are irregular, ill-paved, and steep. In the middle of the city, rises the lofty, massive cathedral, surrounded by numerous churches and convents, mostly deserted, for here the churches are without congregations, and the streets and walks are almost destitute of people. The cathedral, completed in 1492, and built on the site of a former mosque, is a large edifice, in simple, pointed Gothic. It was ransacked and plundered in 1521 and 1808, but previous to these events, its interior was of the most magnificent description. The stained glass that remains is superb; the choir is a perfect museum of high class sculpture; and there are two pulpits of metal, gilt, the workmanship of which is as fine as that of the richest plate. The cathedral is 404 feet long, and 204 feet wide; and has 5 naves, supported on 84 piers. Connected with the cathedral are an extraordinary number of chapels, of great interest, alike from their architectural beauty, their decorations, and their historical associations. The *Fabrica de Armas*, or manufactory of Toledan swords, a huge building, was erected in 1788, though long before that time the Toledan blades had become famous, having been written about both by Livy and Polybius. The temper of the best Toledan blades is such, 'that they are sometimes packed up in boxes, curled up like the mainspring of a watch.' Pop. (1845) 13,431; (1877) 21,297.

T., the *Toletum* of the Romans, was taken by Marius Fulvius in 193 B. C. It was the capital of the Goths. In 714 it fell into the possession of the Moors, who retained it till 1085, when it was annexed to the crown of Castile. In the days of its highest prosperity, it is said to have contained 200,000 inhabitants.

TOLEDO, a flourishing city of Ohio, at the western extremity of Lake Erie, pleasantly situated on an elevated plain on the banks of the Maumee River, 4 miles from its mouth, 112 miles west of Cleveland, and 65 miles south of Detroit. The river affords a safe and spacious harbour for steamers and vessels of the largest class. T. is the terminus of the Miami and Erie Canal, extending south to Cincinnati, and of the Wabash and Erie, connecting the Wabash at Terre Haute with Lake Erie, together 700 miles in length. T. is connected by railroad with St Louis and Cincinnati, by two roads with Chicago, also with the salt regions of Michigan, the coal of Ohio, and with the East by the leading lines. The commercial facilities of T. are extensive, and are growing with its increasing trade. Her ten grain elevators have a storage capacity of 2,712,000, and can receive and ship daily 460,000 bushels. During the year 1870 T. received 6,581,471 bushels of wheat; 6,294,032 bushels of corn; 4,103,139 bushels of oats; 3,233,971 pounds of wool, and 196,434,693 feet of lumber. In 1870, 245 vessels, of 43,940 tons, entered, and 208 vessels, of 40,306 tons, cleared the port. The declared value of goods imported from foreign countries in 1870 was $283,329, and the exports, $1,836,782. The trade of T. is rapidly increasing. In 1870 there were 91 wholesale houses, doing a business amounting to $16,926,427. The grain commission business reached the sum of $34,506,472. A line of steamers plies to Montreal in connection with a line to Europe direct. The churches, hotels, warehouses, and especially the school-houses of T. are substantial and elegant. There are 34 churches, 1 convent, 3 asylums, 8 school-houses, 4 banks, 4 savings-banks, 3 daily, 7 weekly, and 2 monthly journals, 5 foundries, 16 saw and planing mills, 4 flouring mills, 15 hotels, and 50 manufacturing establishments. It is the third city of Ohio, and increased 130 per cent., according to the census returns, from 1860 to 1870. Pop. in 1870, 31,731; in 1880, 50,137.

TOLERA'TION is the liberty which, in some countries where a particular form of religion is established by law, is allowed to nonconformists to publicly teach and defend their theological and ecclesiastical opinions, and to worship whom and how they please, or not at all. But no permission is thereby given to violate the rights of others, or to infringe laws designed for the protection of decency, morality, and good order, or for the security of the governing power. The enforcement of this class of laws, which have merely civil and political objects in view, is indispensable to the public welfare, and must proceed without regard to the notions of religious duty which their contraveners

may entertain or profess. In Britain, there are still in force certain statutes imposing penalties on opinions and practices generally regarded as impious, and which were thought to be criminal because of their offensiveness to God (see BLASPHEMY); but these laws are seldom executed now, the opinion having become prevalent, that, except when the religious feelings of the public are so wantonly outraged as to make the perpetrator a nuisance, theological error is best opposed by refuting it, and that when those accused of Heresy (q. v.) are men of piety and earnest conviction, any degree of severity short of extirpation tends rather to diffuse than to suppress their tenets. Besides, the right of private judgment in matters of faith and worship is now more generally recognised *in practice* than it used to be, though such is human pride that even yet many resent the exercise, by their neighbours who differ from them, of the freedom which they claim for themselves. They seem to forget the maxim that we should do to others as we would have others to do to us—a principle admirably applied by St Paul to the case of religious differences (Rom. xiv.), and which indeed is the only one that has been found to work well in all circumstances for every sect: it condemns not only political disabilities and restraints unwarranted by the exigences of the state, but still more, that uncharitable treatment through which, almost exclusively, the spirit of intolerance can now find a vent in free Protestant countries. Were it not for the inconsistency thus displayed in our own day by many professing advocates of the right of private judgment, it might seem wonderful that the Reformers, by whom that right was first asserted, and who on no other ground could justify their separation from the church of Rome, became in their turn the persecutors, not only of the Romanists, who had persecuted them, but of such fellow-Protestants as had drawn from Scripture conclusions that differed from their own. Instances of such inconsistency on the part of the Reformers and their successors will be found in the articles CALVIN, SERVETUS, SOCINUS, BIDDLE, and JEWS. In a church claiming Infallibility (q. v.), and believing that salvation is unattainable beyond her pale, it is not only consistent, but to her most earnest members must seem a duty, to prevent by force the spread of what is accounted a fatal heresy; and, in fact, toleration has never been either professed or practised by the church of Rome. See ALBIGENSES, WALDENSES, DOMINICANS, INQUISITION, HUGUENOTS, BARTHOLOMEW'S (ST) DAY, NANTES (EDICT OF), CEVENNES, DRAGONNADES. But even the Puritans (q. v.), though long oppressed themselves, were so blind to the right of others to differ from them, that in their own brief day of power they eagerly repudiated, by word and deed, as a monstrous and impious error, the principle of a universal toleration. In the Assembly of Divines (q. v.) held at Westminster in 1643—1646, the Presbyterian members fought successfully against the proposal of the Independents that all sects should alike be tolerated. 'We hope,' wrote Baillie to his Presbyterian friends in Scotland, 'that God will assist us to remonstrate the wickedness of such a toleration . . . . For this point, both they and we contend *tanquam pro aris et focis*' (Baillie's *Letters*, ii. 328, 350; Bannatyne Club ed.: see also the strong expressions of George Gillespie, another member of the Assembly, in his *Propositions concerning the Ministry and Government of the Church*, prop. 41 and 42). We accordingly find in the 23d chapter of the *Westminster Confession* an assertion of the duty of the magistrate to promote the true religion, and to restrain and punish heterodoxy—a principle which, soon after the Restoration, was found to work very inconveniently for the Presbyterians themselves, the magistrate being then one who differed from them as to what the true religion was. The Independents, on the other hand, had learned the lesson of toleration in Holland—that nursery of liberty in modern Europe—whither they had fled from oppression in the reign of James I.; and it is a mistake to suppose, as some have done, that they were the first to understand and practise the principles of religious freedom. In the 16th c., Zuinglius and the Hungarian reformer Dudith, disclaimed, by word and action alike, the notion that any man is entitled to assume, in his dealings with others, that his own interpretations of Scripture are true, and those of other men, if different, false and culpable. 'You contend,' wrote Dudith to Beza, 'that Scripture is a perfect rule of faith and practice. But you are all divided about the sense of Scripture, and you have not settled who shall be judge. You say one thing; your opponent, Stancarus, says another. You quote Scripture; he quotes Scripture. You reason; he reasons. You require me to believe you: I respect you; but why should I trust you rather than Stancarus? You say he is a heretic; but the papists say you are both heretics. Shall I believe them? . . . . You say that your lay hearers, the magistrates, and not you, are to be blamed, for it is they who banish and burn for heresy. I know you make this excuse; but tell me, have not you instilled such principles into their ears? . . . . Do you not daily teach that they who appeal from your Confessions to Scripture ought to be punished by the secular power? . . . . When you talk of your Augsburg Confession, and your Helvetic Creed, and your unanimity, and your fundamental truths, I keep thinking of the sixth commandment—"Thou shalt not kill."' In the history of England, also, from the Reformation to the Commonwealth, there is, as Bishop Heber has observed, 'abundant proof that (much as every religious party, in its turn, had suffered from persecution, and loudly and bitterly as each had, in its own particular instance, complained of the severities exercised against its members) no party had yet been found to perceive the great wickedness of persecution in the abstract, or the moral unfitness of temporal punishment as an engine of religious controversy. Even the sects who were themselves under oppression exclaimed against their rulers, not as being persecutors at all, but as persecuting those who professed *the truth;* and each sect, as it obtained the power to wield the secular weapon, esteemed it also a duty, as well as a privilege, not to bear the sword in vain.'—*Life of Jeremy Taylor*, p. 27. It is chiefly to the many keen discussions in Holland and England during the century which followed the Restoration (aided, no doubt, by that moderation or indifference which characterised the Protestant churches a hundred years ago—by the ever-increasing number and power of the dissenters—and by that wider mental culture which enables men not only to see that diversity of mental gifts and acquirements naturally leads to diversity of opinion, but, in Cromwell's language to 'think it possible they may be mistaken'), that we must ascribe the tolerant spirit now actuating most of the statesmen of England and the United States, and which has lately made rapid progress among the people at large. Not only is the *right* of free thought and discussion now generally recognised, but its *necessity* to the well-being of mankind is asserted by eminent thinkers. Mr John Stuart Mill, in his able treatise *On Liberty*, thus sums up the grounds on which the necessity of such freedom is affirmed by him: '(1) If any opinion is compelled to silence, that

opinion may, for aught we can certainly know, be true. To deny this, is to assume our own infallibility. (2) Though the silenced opinion be an error, it may, and very commonly does, contain a portion of truth; and since the general or prevailing opinion on any subject is rarely or never the whole truth, it is only by the collision of adverse opinions that the remainder of the truth has any chance of being supplied. (3) Even if the received opinion be not only true, but the whole truth; unless it is suffered to be, and actually is, vigorously and earnestly contested, it will, by most of those who receive it, be held in the manner of a prejudice, with little comprehension or feeling of its rational grounds. And not only this, but (4) the meaning of the doctrine itself will be in danger of being lost, or enfeebled, and deprived of its vital effect on the character and conduct: the dogma becoming a mere formal profession, inefficacious for good, but cumbering the ground, and preventing the growth of any real and heartfelt conviction, from reason or personal experience' (p. 95).

See Jeremy Taylor's *Liberty of Prophesying;* Milton's *Areopagitica, Treatise of Civil Power in Ecclesiastical Causes*, and his treatise *Of True Religion, Heresy, Schism, Toleration, &c.;* Dr John Owen's *Indulgence and Toleration Considered;* Barclay's *Apology for the Quakers*, prop. 14; Locke's *Letters concerning Toleration*, and treatise *On the Conduct of the Understanding;* William Penn, *The Great Case of Liberty of Conscience defended;* Ibbot's *Boyle Lectures on the Right, Duty, Benefits, and Advantages of Private Judgment;* Paley's *Moral Philosophy*, b. 6, ch. 10; Sydney Smith's *Letter to the Electors on the Catholic Question;* D'Israeli's *Curiosities of Literature*, article 'Toleration;' Hallam's *Literature of Europe* (Part iii. ch. 2); Whately's *Essays on the Errors of Romanism, &c.;* J. Blanco White *On Heresy and Orthodoxy;* Brook's *History of Religious Liberty;* James Martineau's *Rationale of Religious Enquiry;* Samuel Bailey's *Essay on the Formation of Opinions*, and *On the Pursuit of Truth;* Tayler's *Retrospect of the Religious Life of England;* and *The Edinburgh Review*, vol. 76, p. 412.—In regard to the manner in which the early Christians became liable to punishment under the Roman laws, see Neander's *History of the Christian Religion and Church*, vol. i. p. 118, Bohn's ed.; Gibbon's *Decline and Fall of the Roman Empire*, ch. 16, compared with ch. 2; Dr Taylor's *Elements of Civil Law*, App.; Edgar Taylor's *Book of Rights, or Constitutional Rights and Parliamentary Proceedings affecting Civil and Religious Liberty in England, from Magna Charta to the Present Time;* and the articles ANTONINUS (MARCUS AURELIUS), DECIUS, and PERSECUTIONS, in the present work.

TOLERATION, ACT OF. See ACT OF TOLERATION.

TOLL (Gr. *telos*, a public tax; Gr. *telonion*, Lat. *telonium*, a toll-house; Ang.-Sax. *tol*, Ger. *zoll*, seem related to the root Ger. *zahl-*, Eng. *tell*, to count, to pay), a payment exacted under a royal grant, or some prescriptive usage, or by express statute; such as by the owner of a port for goods landed or shipped, by the owner of a market or fair for articles sold, or by those charged with the maintenance of roads, streets, bridges, &c., for the passage of persons, goods, or cattle. It is essential in a toll that it be for some reasonable consideration; otherwise, it is void. In modern times, the right to take toll is always created by statute, and nothing short of statutory authority will authorise its levy, for it is a species of tax.

Many tolls receive special names, as dues, customs, &c.; and the term toll is now mostly used in connection with turnpike roads (so called from the turnpike or gate turning on an upright axis or pike, at which the tolls are collected) and bridges. See HIGHWAY.

The first express authorisation of a road-toll on record bears date 1346, when a commission was granted by King Edward III. to lay a toll on carriages passing from St Giles to Temple Bar, and also on carriages passing towards Portpool, now Gray's Inn Lane, London, the roads in those places having become impassable from want of other provision for their maintenance. From that small beginning, the turnpike system gradually spread itself over all England, and latterly over Scotland and Ireland. The earliest Scottish Turnpike Act was passed in 1750. Previously, by statutory enactments in 1617, 1661, and 1669, the Scottish highways were made and maintained by what is called the 'statute-labour' system, under which the labouring population could be called on to give six days' work yearly upon the roads in their parishes. This poll-tax, either in the shape of personal labour, or of conversion-money in lieu of it, remained in force, in regard to all but turnpike roads, till 1845, when the General Statute-Labour Amendment Act (8 and 9 Vict. c. 41) abolished it, and substituted assessments on land.

Beginning with 1750, turnpike roads gradually spread over Scotland, under authority of about 400 separate acts of parliament, till there was a very considerable mileage; and in Ireland, the turnpike system extended over all the kingdom. According to a parliamentary Report in 1840, there were in England and Wales 104,772 miles of turnpike roads; and a similar Report for Scotland in 1859 gives 5768 miles of turnpike roads in that kingdom, with 1060 toll-gates thereon. The original erection of toll-gates excited violent opposition in many parts of the country, and their maintenance has frequently led to popular violence and rioting.* Even those who are sensible that good roads are worth paying for at any reasonable cost, have all along felt the toll-system to be an annoyance and obstruction to traffic, from the continual stoppages to pay or exhibit tickets; often unjust in its application; and unnecessarily expensive. The wastefulness of the turnpike system is astonishing to think of. The local acts of parliament, and the constantly recurring litigation, is a serious expense, to begin with; but the chief waste is in the machinery for collecting the revenue. Besides the erection and maintenance of toll-houses and gates (one for every 6 to 8 miles), there were, at the census of 1861, about 6000 persons employed in England and Scotland as toll-collectors; and assuming these to be heads of families with five persons in each, there are (or were) 30,000 individuals to be maintained, which must absorb a high percentage of the revenue levied on the public.

In 1845, Mr William Pagan of Cupar-Fife published a plan of 'Road Reform,' in which he directed public attention to the evils of the toll-bar system, and advised its discontinuance, the substitute proposed by him being a rate on horses, or an assessment on the lands and heritages in each county and burgh, for the support of all roads (statute-labour roads included) and bridges within the respective counties and burghs.

Ireland, which was studded all over with gates on its turnpike roads, took the lead in toll-bar abolition. The roads in the south of Ireland were the first cleared of gates; Dublin and its environs

* Notably in South Wales, in 1843, where a band of conspirators, calling themselves Rebeccaites (in allusion to Gen. xxiv. 60), carried on the systematic demolition of toll gates and houses for nearly a year.

followed; and an act was passed in 1857, abolishing the whole of the remaining toll-bars; and by April 5 following, the toll-bar system, and all its costs and charges and vexations, disappeared from Ireland. There, the supporting of the roads by land-assessment is much preferred to the defunct toll system. The Isle of Man also is overspread with excellent roads, with no tolls upon them. The financial management of roads by turnpike trustees in England and Scotland has proved eminently unsuccessful, there being an accumulation of debt on the turnpike roads in England to the amount of about four millions sterling, and in Scotland, to the amount of two millions and a half.

The question of toll-bar abolition has been much agitated in England—the inconvenience of the system becoming every day more sensibly felt since the introduction of railways. The efforts of the Anti-toll Association of London have succeeded in freeing the suburbs of the metropolis, and a considerable space on both sides of the Thames, from 153 toll-gates. But although there have been repeated inquiries before both Houses of Parliament, shewing clearly the evils of the toll-bar system, no measure has been taken for its entire abolition in any one county of England. In Scotland, several attempts have been made since the Roads Commissioners' Report of 1859, to obtain a general act, compulsory or permissive, for the abolition of all toll-gates within the kingdom—attempts which hitherto have been unsuccessful. Various counties, however, have obtained acts for themselves, for ending their toll-gates, and maintaining all their roads and bridges by assessment on lands and heritages—the rule usually being, that the proprietors should clear off any debt on the roads, and that the maintenance should be divided between proprietors and tenants. The counties which have obtained abolition acts, are: Aberdeen, Banff, Caithness, Cromarty, Elgin, Dumfries, Haddington, Kirkcudbright, Nairn, Peebles, Ross, and Wigton. The following counties never adopted the toll-bar system, but all along maintained their roads by assessment, or by grant from government: Argyle, Bute, Orkney, Sutherland, and Zetland. The other counties still maintain their roads and bridges by the complicated system of turnpike tolls, and statute-labour and bridge-assessments. The toll revenues in these and in most of the English counties have diminished, from the diversion of the through-traffic to railways; while the chief costs, and notably that of collection, remain as great as before. Notwithstanding the prejudices, and narrow mistaken views of personal and local interests, which continue to resist this, as they have resisted most other important reforms, sooner or later, the toll-bar system must apparently give way, and the word 'toll,' as applicable to collection of moneys at gates on public roads, become obsolete.

TOLLENS, Hendrik, the most popular Dutch poet of modern times, was born at Rotterdam, September 24, 1780. At the early age of 14, his father, a merchant in dyestuffs, placed him in his counting-house, and first looked favourably upon, but afterwards discouraged the boy's poetical efforts. The sympathies of young T. were at that time with what was called the patriotic party, who thought that the entrance of the French, in 1795, would be the cure for all political evils, and he made many verses in the spirit of the times. In his 17th year, he began to study English, German, and Latin; but French literature was his favourite study, and translations of French tragedies his chief work. At 19, he published translations from the French poets, under the title of *A Nosegay of Fragrant Flowers culled on French Ground.* Three years later, appeared his *New Songs and Idyls*, in which he first came out as an original poet. Shortly after, followed another collection of miscellaneous poems, which shewed more marked progress; in 1805, his tragedy of *Lucretia*; and in 1806, that of the *Hoekschen and Kabeljaauwschen*, or the Contest between the Nobility and the Towns in Holland, in the olden time—both original pieces of great merit. In 1804, Loots carried off the first prize, and T. the second, for a poem on Hugo de Groot; and in 1806, the order was reversed, when both again sung the death of Counts Egmont and Hoorn. There flowed from his pen an uninterrupted series of songs and poems, in which the warmest feelings were expressed in the most natural and chaste language. Of these may be mentioned, as a few gems, 'William I.,' the 'Victory at Nieuwpoort,' the 'Four Days' Naval Fight,' the 'Cry to Arms in 1815,' the 'Wintering of the Dutch in Nova Zembla,' and the 'National Song of the Netherlands,' which is an echo of the calm but patriotic spirit of the people. His deep fellow-feeling with his countrymen is seen in the poems which he wrote during the Belgian revolution in 1830—1831, as in the heart-stirring poems, 'The Evening Prayer,' and 'The General Prayer-day.' The popularity which T. attained, his poems reaching the fifth edition in 1831, arose chiefly from his singing of subjects always dear to the heart of the nation—of family-life, country, religion, and love—and that in simple, unartistic language, and pure Dutch style. The people loved the poet because they understood him, and his words touched their hearts. T. published *Romances, Ballads, and Legends* (1818); *New Poems* (1821—1829); *Songs of Claudius* (1832); *Poetical Flowers gathered from Neighbouring Nations* (1839); *Scattered Poems* (1840); two volumes (1850), in which, though advanced in life, the tone of his lyre was more beautiful, powerful, and rich than ever. T. died at Rijswijk, October 21, 1856.

Of modern Dutch poets, T. stands in the first rank. The Wintering in Nova Zembla is the most wonderful piece of descriptive poetry in the Dutch language. T. was an excellent man, distinguished for his sincere piety and benevolence. His compassion for the poor comes out in his *Bedelbrief*, or Begging-letter, which he published for the benefit of the distressed in the severe winter of 1844—1845. While the people's poet, he was also God's priest for spreading Christian love among men. In early life, T. belonged to the Roman Catholic Church, and in 1827 joined the Protestant Remonstrants; but both before and after the change, he was essentially a religious man.

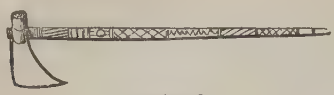
TOLO'SA, a town in the north of Spain, capital of the province of Guipuscoa, 15 miles south of the seaport of San Sebastian. It stands in a deep valley watered by two streams, and abounds in old family mansions. There is a royal factory for arms, and in the vicinity are zinc and lead mines. Pop. about 5000.

TOLU. See Balsam.

TOLU'CA, a town of Mexico, capital of the department of the same name, 20 miles south-west of the city of Mexico. It is handsomely built; beautiful arcades line the streets; and the plain on which it stands is fruitful in maize and other products. Pop. 12,000.

TO'MAHAWK, a light war-hatchet of the North American Indians. The early ones were rudely made of stone, ingeniously fastened to their handles by animal sinews, or cords of skin. European traders supplied hatchets of steel, the heads of which were made hollow, for a tobacco-pipe; the handle of ash, with the pith removed, being the stem. These hatchets are used in the

chase and in battle, not only in close combat, but by being thrown with a wonderful skill, so as always to strike the object aimed at with the edge



Tomahawk.

of the instrument. The handles are curiously ornamented. In the figurative language of the Indians, to make peace, is to bury the tomahawk; to make war, is to dig it up. The engraved figure of a tomahawk is from George Catlin.

TOMA'TO, or LOVE-APPLE (*Lycopersicum esculentum*), a plant of the natural order *Solanaceæ*, formerly ranked in the genus *Solanum*, and known as *S. Lycopersicum*. The genus *Lycopersicum* is distinguished by a 5—6-parted calyx, a wheel-shaped 5—6-cleft corolla, five stamens, and a 2—3-celled berry, with hairy seeds. The T. is an annual, from two to six feet in height, requiring support when tall. The leaves are unequally pinnate, the leaflets cut; the flowers numerous, followed by berries, which are very various in shape and colour—generally red and yellow—in different varieties. The plant is a native of the tropical parts of America, but is now much cultivated in all parts of the world suitable for it, as the south of Europe and the United States. In Britain, it requires a hot-bed in spring. The fruit is much used for sauces, ketchup, preserves, confectionary, and pickles. The unripe fruit makes one of the best of pickles. Tomatoes appear with almost every dish in Italy. The use of them is rapidly increasing in Britain and other countries.

TOMB (Gr. *tymbos*), a monument erected over a grave, in order to mark the resting-place, and preserve the memory of the deceased. In early ages, and among eastern nations, it sometimes became the practice to place the remains of the dead in excavated sepulchres, whose interior was often decorated with painting or otherwise. Where the usage was to burn the dead, their bones and ashes were placed in urns in these receptacles. Some of the most remarkable rock-tombs were those of Egypt, belonging to the 18th and following dynasty of the Theban kings. The monarch's burial-place began to be excavated as soon as he ascended the throne, and the excavation went on year by year, the painting and decoration progressing till the king's death, when it was suddenly broken off, the tomb thus becoming an index both of the king's magnificence and of the length of his reign. The most costly articles are often found in these sepulchres. The decoration was almost entirely reserved for their interiors, the façades being comparatively unobtrusive. On the other hand, the rock-tombs of Persia and Lycia, less rich and elaborate internally, have imposing architectural façades, those of the Persian kings being copied from their palaces; and during the Roman period, this species of magnificence prevailed at Petra (q. v.) to an extent that gives that now deserted valley the aspect of a city of the dead. See also ETRURIA.

Tombs, in more modern times, have generally been mounds or masses of building raised over the remains of the dead. In the Homeric poems, heaps or cairns of stones are placed as honorary memorials above the graves of departed heroes. The Sepulchral Mound (q. v.) or tumulus of rude ages is found over the greater part of Northern Europe, and is probably older than the subterranean tomb. The Pyramids (q. v.) were the sepulchres of the Egyptian monarchs from the 4th to the 12th dynasty. The tombs of Greece, and still more those of the Greek colonies in Asia Minor, were sometimes pillars, or upright stone tablets, sometimes small buildings in the form of temples. The most celebrated was the *Mausoleum* (q. v.). The Roman tombs were not unfrequently important architectural structures, varying in form, but oftenest consisting of a circular tower resting on a square basement; familiar examples being the tomb of Cæcilia Metella, and the yet larger and more solid tomb of Hadrian, on the banks of the Tiber, best known as the Castel St Angelo, which is about 220 feet in height, and of immense solidity. In Rome, Latium, and Magna Græcia, tombs were generally erected outside the towns, and along the principal roads leading into the country, as in the Via Appia at Rome, and the Street of Tombs at Pompeii. A form of excavated tomb, without external architecture, called *Columbarium* (q. v.), was also in use in Rome, whose walls were pierced with cells to receive cinerary urns. The prevalent circular tomb became in the later period of the Roman Empire polygonal; and the central chamber, at first small, was gradually increased, till, in the age of Constantine, it became something like a miniature representation of the Pantheon, generally with a crypt below the principal apartment.

In the earlier centuries of Christianity, the burial of the dead in churches was prohibited. The first step which led to its adoption was the custom of erecting churches over the graves of martyrs; then followed the permission to kings and emperors to be buried in the church porch. The most important tombs of the middle ages are generally within churches or cloisters. There is much variety in the form and enrichment of medieval tombs. The earlier examples consist of a simple stone coffin, or sarcophagus, often with a low gabled lid and a sculptured cross. An altar-tomb, or tomb in the form of a table, followed; and in the 13th c., a species of tomb was introduced, consisting of a sarcophagus, on which rests a recumbent figure of the deceased, the whole being surmounted by a canopy, often of exquisite symmetry and richness. In the renaissance period of art, the tombs became more and more complex. The sarcophagus was disguised, or made the least important part of the monument; the representation of the deceased was confined to a medallion likeness, and the most prominent part of the tomb was composed of sculptured upholstery, and groups of symbolical and eventually mythological figures. In some of the 16th c. examples, as Michael Angelo's tombs of Giuliano and Lorenzo di Medici, at Florence, the inappropriateness of the design is partly redeemed by the beauty of the figures; but in the succeeding centuries, the vicious taste of these monuments rapidly increased, till it culminated in some of the hideous tombs that disfigure Westminster Abbey and St Paul's.

TO'MBAC, or WHITE-COPPER, is an alloy formed of about 75 parts of copper and 25 parts of arsenic; it is used in the manufacture of buttons, and is a very beautiful metal.

TOMSK, a government of Western Siberia, bounded on the E. and N.-E. by the government of Enisei or Yeneseisk, and on the N.-W. and W. by that of Tobolsk. Area, 324,275 sq. m.; pop. 714,746. T., more than any other government of Siberia, abounds in lakes and rivers. Of the latter, most of which flow northward from the foot of the Altaï Mountains, the principal are the Ob, Tom, Chulim, and Irtish. The largest lakes, which are both sweet and brackish, occur in the Barabinsky

Steppes. The climate is mild in the middle and southern districts, but severe in the north. Sandy and clayey soils prevail; but there are patches of good mould on which abundant crops of grain of various kinds, as well as hemp, flax, and tobacco, are raised. The extensive mountain-slopes and plains are covered with luxuriant forests, in which the most common trees are the broad-leafed oak, the cedar, and the pitch-tree. The natural products of the country are numerous. In the south and east parts, droves of wild horses and herds of horned cattle are a source of considerable wealth. But the mineral products of the country are its chief source of riches. Manufactures are not extensively carried on; there is a large barter-trade with China, and the commerce of the country is maintained for the most part by means of fairs.

TOMSK, a trading-town of Siberia, capital of the government of the same name, on the Tom, a tributary of the Ob, 2809 miles east of St Petersburg, in lat. 56° 30′ N., and long. 84° 58′ E. Situated on the great trading highway of Siberia, it is the seat of an important transit-trade, chiefly with the Kalmucks and Mongols; but the goods that pass to and from Irkutsk also go by way of this town. There are upwards of 50 manufactories, chiefly for soap, leather, and distilled liquors, and the most important commercial article is furs. It is said to be the richest town in Siberia; and its commercial importance, its extent, and the number of its handsome buildings, are increasing annually. Pop. about 25,000.

TON, a suffix of frequent occurrence in the names of Anglo-Saxon settlements. It seems to be from the same root as the Gothic *tains*, meaning a twig (allied to which are the *tine* of a fork, the *tines* of a stag's horns, the *tines* of a harrow), the Ang-Sax. *tynan*, to hedge, and the Ger. *zaun*, a hedge. 'Hence, a *tun* or *ton* was a place surrounded by a hedge, or rudely fortified by a palisade. Originally, it meant only a single homestead or farm, and this use of it is still common in Scotland. In modern English, in the form of *town*, it is applied to a collection of houses. Similarly with *ton*, the terminations *worth*, *fold*, *garth*, *burgh*, and others also convey the notion of enclosure, protection.'—See I. Taylor's *Words and Places.*

TON, the same word as TUN (q. v.), denotes a weight of 20 hundred-weight (*cwt.*). In Britain, the hundred-weight contains 112 lbs., so that the ton contains 2240 lbs. In the United States the hundred-weight is usually reckoned at 100 lbs., and the ton at 2000 lbs. In both countries, 40 cubic feet of rough or 50 of hewn timber constitute a ton or load of the same. The hundred-weight (*centner*) in Austria, Prussia, Denmark, Germany, and Switzerland, contains 100 lbs.; in Hamburg, 112; in Bremen, 116; its representative in France, Spain, and Portugal, is the Quintal (q. v.); in Italy, the Centinajo; in Turkey, Egypt, Northern Africa, and the Balearic Isles, the Kantar (124 lbs.).

TONE, in Music, the name given to the larger intervals in the diatonic scale, so called in contradistinction to the *Semitones* (q. v.), or smaller intervals. Theoretically, some of the intervals called tones are larger than others, and none of them are equal to two semitones; thus, in the scale of C, the intervals CD, FG, and AB, are all equal; but DE and GA, which are also called tones, are smaller; and the semitones, EF and BC, are larger than half even of the larger tones. In instruments, however, which are tuned according to the equal temperament (see TEMPERAMENT), all the tones are made equal, and each equivalent to two semitones.

TO'NGA BAY, a small inlet on the east coast of Africa, bounded on the N. by Cape Delgado, and extending inland in a north direction. Cocoa-nut trees and jungle line the shores of the bay, and at its head is the village of Tonga, small and insignificant, but important from its frontier position. Cape Delgado is the northern limit of the Portuguese colonial possession of Mozambique; and the village of Tonga, which is situated north of the parallel of latitude of the Cape, is in the possession of the Imaum of Muscat, and is the most southern possession of that sovereign.—*Despatches from Her Britannic Majesty's Consul and Political Agent, Zanzibar*, 1863.

TONGA ISLANDS AND TONGATABU. See FRIENDLY ISLANDS.

TONGRES, a very ancient city of Belgium, in the province of Limbourg, 13 miles south-south-east of Hasselt. Its church of Notre Dame, the first dedicated to the Virgin north of the Alps, dates from 1240; and the cloister attached, the oldest in the country, was built in the 10th century. The mineral spring in the vicinity, of which Pliny wrote: '*Purgat* hic corpora, tertianas febres discutit, calculorumque vitia,' still retains its ancient virtues. Various manufactures are carried on. Pop. 6800.

TONGUE, THE, is a symmetrical muscular organ, extending from the hyoid bone backwards and downwards, to the lips in front, and occupying the buccal cavity. The superior surface, borders, and anterior third of the inferior surface, are free; while the remaining parts are attached to adjacent

The upper surface of the Tongue, shewing the Papillæ:

1, the raphé or mesial line; 2, 2, the lateral parts; 3, the tip; 4, 4, the sides or edges; 5, 5, the V-shaped mass of circumvallate papillæ; 6, the foramen cœcum; 7, the mucous glands at the root of the tongue; 8, the epiglottis; 9, 9, 9, the fræna epiglottides; 10, 10, the greater horns of the hyoid bone.—From Sœmmering.

parts by the investing mucous membrane and subjacent structures. At certain points, this membrane, on leaving the tongue, forms distinct folds, containing fibrous or muscular tissue, which act to a certain extent as ligaments to the tongue. The most considerable of these folds is termed the *frænum* (or bridle) of the tongue, and connects its anterior free extremity with the lower jaw. It acts as a strong ligament, and limits the backward movement of the tip of the tongue. In rare cases, this ligament extends abnormally to the tip, so as to interfere with speech

and mastication, and the child is said to be *tongue-tied;* recourse must be then had to division of the frænum, popularly known as *cutting the tongue.* Other folds of mucous membrane (the *glosso-epiglottid* folds) pass from the base of the tongue to the epiglottis; while from the sides of the base, passing to the soft palate, are seen two folds on either side, known as the *pillars of the fauces.* See PALATE. The *superior surface* of the tongue is divided into two symmetrical lateral parts by a median longitudinal furrow, commencing at the tip, and extending back about two-thirds of the tongue's length. The various kinds of papillæ which are seen on their surface are described in the article TASTE, ORGAN AND SENSE OF. At the back of the surface, just behind the circumvallate papillæ, are large mucous glands, extending into long and capacious canals, and helping to secrete the fluid that moistens the tongue. On the *inferior surface,* the longitudinal furrow, which extends from the tip to the frænum, is deeper than on the upper surface; on each side of it, veins are seen running forwards; and immediately beneath the tip is a cluster of mucous glands, known as the glands of Nuck (their discoverer in 1690). The *posterior extremity,* or *base,* is flattened and extended laterally before it is inserted into the *hyoid bone* (known also as the *lingual* or *tongue bone*), which, with certain ligaments, must be regarded as the basis or framework of the tongue. The muscles of the tongue are usually divided into two groups—viz., the *extrinsic* muscles, which attach the tongue to certain fixed points external to it, and move it on them; and the *intrinsic* muscles, which pass from one part of the tongue to another, constitute its chief bulk, and move it on itself. These intrinsic muscular fibres run vertically, transversely, and longitudinally, and are so interlaced as mutually to support one another, and to act with the greatest advantage. By the action of the various muscles, the upper surface of the tongue may be made concave or convex, or may be pressed against the roof of the mouth; the tip may be protruded straight out or laterally, upwards and downwards, and to any recess (as, for instance, a hollow tooth) within the mouth where food might lodge; and the whole organ may be drawn back. The organ is freely supplied with blood, mainly by the lingual artery, which is given off by the external carotid. With regard to the nerves, the glosso-pharyngeal and certain branches of the third division of the fifth nerve are concerned in the special sense of Taste (q. v.); other branches of the fifth nerve are concerned in ordinary sensation, while the hypoglossal nerve on each side is the motor nerve of the tongue.

The various uses or functions of the tongue cannot be thoroughly understood without a brief reference to its comparative anatomy. The tongue in mammals does not differ very materially from that of man; but in general there is a close coincidence both in size and form between this organ and the lower jaw. In the rodents, the tongue has a wedge-like shape. In the giraffe and the ant-eater, the tongue is much prolonged, being an important prehensile organ in the former; while in the latter, it is driven into ant-hills, and the victims are secured by its viscid secretion. In the feline races, the conical papillæ are converted into recurved spines of great size and strength, which the animal uses in scraping bones and in combing its fur. Except in mammals, the tongue is probably not an organ of taste. For a good description of the tongue in birds, reptiles, and fishes, the reader is referred to Professor Owen's *Anatomy of the Vertebrates,* vols. i. and ii. Amongst the Mollusca, the Gasteropoda are provided with a very singular apparatus known as the tongue, and consisting generally of a thin membrane, long and narrow, and rolled, except at its anterior extremity, into a tube. This membrane is covered on its upper surface with transverse rows of minute teeth, or more commonly with plates having tooth-like siliceous projections. These teeth present a great variety of patterns, which are constant in the different genera, and even characterise the species. Two eminent naturalists, Messrs Loven, a Swede, and Troschel, a German, have independently made the teeth of the Mollusca a basis of classification. The Articulata do not present anything like a true tongue, although in insects a certain oval appendage is described as a *lingua.*

The functions of the tongue are gustation, prehension (in man and monkeys this function is supplied by the hand), mastication, insalivation, deglutition, and speech; to which may be added, spitting and whistling, and in the case of the Gasteropoda, the trituration of the food.

Amongst the diseases of the tongue may be mentioned INFLAMMATION or GLOSSITIS. The most marked characteristics of this affection are great swelling, tenderness, and difficulty in speaking and swallowing. It rarely occurs as an idiopathic or spontaneous affection, but often accompanies severe salivation. It must be treated by purgatives and low diet, and by gargling, as in ordinary Salivation (q. v.). Incisions are sometimes useful, both to relieve tension, and by the depletion that ensues. Cases occasionally occur in which the tongue suddenly enlarges to an immense size, so as almost to cause suffocation, without any true sign of inflammation.—See Druitt's Surgeon's *Vade-mecum,* 8th ed., p. 454, foot-note.

Hypertrophy, or *persistent enlargement* of the tongue, sometimes results from an imperfectly cured case of inflammation; but is probably in most cases congenital, although perhaps not noticed for a year or two. Bertholin (*Hist. Centur.* iii. p. 85) mentions the case of a male child born with the tongue protruding out of the mouth as large as a filbert; and as the child grew, the tongue increased to the size of a calf's heart. For a reference to various cases, and for the mode of treatment, we may refer to a Memoir by Dr Humphry in vol. 36 of the *Medico-Chir. Transactions.* One of the most common forms of disease of the tongue is *ulceration,* which may arise (1) from the irritation of a decayed tooth with a sharp jagged edge; or (2) from constitutional syphilis; or (3) from a disordered condition of the digestive organs. In the first case, the tooth must be removed; in the second, iodide of potassium with sarsaparilla should be tried; and in the third the complaint generally yields to regulation of the diet and of the digestive organs, and sedatives at bedtime. M. Lawrance recommends a mixture of compound decoction of sarsaparilla with compound decoction of aloes, three times a day, and four grains of extract of hyoscyamus at bedtime, with advantage. *Cancer* of the tongue occurs either in the hard or in the epithelial variety. There is a popular belief that this terrible disease may be excited by the irritation caused by a broken tooth, or by smoking a clay-pipe; but on comparing the prodigious numbers of jagged teeth and of clay-pipes with the rare cases of cancer of the tongue, we must at once reject this hypothesis. All that such sources of irritation can effect is to determine the exact seat of development of cancer in persons predisposed to it. A typical case of epithelial cancer of the tongue occurred in the person of Professor Reid of St Andrews, the eminent physiologist. In December 1847, his age being then 39, and his health good, he noticed a small ulcer on the right side of the tongue; it slowly extended, and acquired

hard everted edges, but caused little inconvenience. In July 1848, it had attained the size of a five-shilling piece; its surface and edges were ragged, and it caused considerable pain, especially at night. A hard ridge could be felt all round the ulcer, and the glands beneath the jaw became enlarged. The health by the end of August had completely given way from the pain, when the diseased part of the tongue was removed by Mr (now Sir William) Fergusson. In less than a month, the wound had healed, and the health was re-established. In November, the enlarged glands were removed; but the disease returned in their scars, and spread till it caused death in July 1849. The only treatment which can be adopted with any chance of success is full and early extirpation. Mr Syme succeeded in removing the whole organ, without even—strange to say—much affecting the patient's speech or power of deglutition. *Tongue-tie* is an affection for which infants are often brought to the surgeon, and which is often performed when it might be dispensed with. The division of the *frænum* with a blunt-pointed pair of scissors, with their point directed downwards, is very easily performed, and fortunately does no harm to the child. Children who do not speak so soon or so clearly as is expected by their mothers, are always supposed to have tongue-tie.

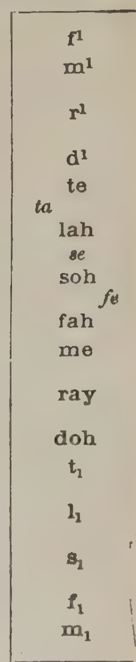
TONGUES, Gift of, a gift of the apostles and other Christians in the first ages of the church. The main passages in the New Testament relating to it are Acts ii. 3—21; 1 Corinthians xii. 10, 28; xiii. 1, and particularly xiv. Allusions to it will also be found in Mark xvi. 17; Acts x. 46, and xix. 6. The only allusion to the possession of the gift in later times is in Irenæus, *Adv. Hær.* vi. 6: 'We have many brethren in the church having prophetical gifts, and by the Spirit speaking in all kinds of languages.' From these data, the following conclusions have been drawn by one of the most recent and intelligent expositors of the Epistles to the Corinthians. The gift in question is represented as something entirely new in the apostolical age: 'They shall speak with new tongues,' Mark xvi. 17. The effect on the spectators at the day of Pentecost is of universal astonishment. It is represented as a special mark of conversion, immediately preceding or following baptism. It is a gift 'of the Spirit:' 'They began to speak with other tongues, as the Spirit gave them utterance'—Acts ii. 4. It was, moreover, closely connected with the gift of 'prophesying'—1 Corinthians xii. 10, 28; xiv. 1—6. It appears to be distinguished from prophesying by consisting not of direct warning, exhortation, or prediction, but of thanksgiving, praise, prayer, singing, and other expressions of devotion. It was an utterance of the heart and feelings, rather than of the understanding, so that the actual words and meaning were generally unintelligible to the bystanders, and sometimes to the speakers themselves: 'He that speaketh with a tongue speaketh *not to men, but to God;* for no one heareth; and in the Spirit he speaketh mysteries'—1 Corinthians xiv. 2, 4, &c. So far, the account of the gift seems intelligible. It was, as Dean Stanley says, 'a trance or ecstasy, which in moments of great religious fervour, especially at the moment of conversion, seized the early believers; and this fervour vented itself in expressions of thanksgiving, in fragments of psalmody or hymnody, and prayer, which to the speaker himself conveyed an irresistible sense of communion with God; and to the bystanders, an impression of some extraordinary manifestation of power, but not necessarily any instruction or teaching, and sometimes even having the appearance of wild excitement, like that of madness or intoxication.' The special difficulty, however, remains, viz., as to the character of intelligibility which, on one prominent occasion, seems to have belonged to the gift. *Glōssa*, or the word translated 'tongue,' does not necessarily imply a distinct language of a people; this is usually expressed in the New Testament by *dialektos*. But in the description in the Acts ii. 6, 8, it is expressly said: 'Every man heard them in his *own language*' (*tē idia dialektō*). 'How hear we every man in *his own language*' (the same phrase in the original) 'wherein we were born.' The plain meaning of this account seems to be, that the gift of tongues, on this occasion, at anyrate, assumed the form of intelligible communications in foreign languages. But there is no evidence that the apostles then, or at any subsequent time, enjoyed the ability, supernaturally imparted, of speaking a variety of languages, with a view to the more adequate discharge of their apostolic functions, as has sometimes been inferred from the passage in the Acts. 'Probably,' it has been said, 'in no age of the world has such a gift been less needed. The chief sphere of the apostles must have been within the Roman Empire, and within that sphere, Greek or Latin, but especially Greek, must have been everywhere understood. Even on the day of Pentecost, the speech of Peter, by which the first great conversion was effected, seems to have been in Greek, which probably all the nations assembled would sufficiently understand; and the speaking of foreign dialects is nowhere alluded to by him as any part of the event which he is vindicating and describing.'—Dean Stanley (*Corinth.* p. 250).

TONIC, or KEYNOTE, in Music, the note which forms the basis of any scale or key, and on which a piece of music written in that key naturally closes. See Key.

TONI'CITY, Muscular. The contractility of muscles shews itself under two distinct forms—*Irritability* and *Tonicity*, which are alike distinct in the mode of their action and in the conditions requisite for their exhibition. Irritability is most manifest in the voluntary muscles and in the heart, which, when in activity, exhibit powerful contractions alternating with relaxation; while Tonicity is shewn in a moderate and permanent contraction, which, instead of being consequent upon stimulation through the nerves, as in irritability, is especially excited by change of temperature in the tissue itself, and is mainly shewn in the involuntary or non-striated muscles. Like irritability, it is an inherent property of muscular tissue during life. 'It manifests itself,' says Dr Carpenter, 'in the retraction which takes place in the ends of a living muscle when it is divided (as is seen in amputation); this retraction being permanent, and greater than that of a dead muscle. But its effects are much more remarkable in the non-striated form of muscular fibre; and are particularly evident in the contractile coat of the arteries, causing the almost entire obliteration of their tubes, when they are no longer distended with blood.' It is to the moderate action of the tonicity of arteries that their contraction upon the current of blood passing through them is due. If the tonicity be excessive, the pulse is hard and wiry; but if it be deficient, the pulse is very compressible, though bounding, and the flow of blood is retarded. From the experiments of John Hunter and many subsequent physiologists, it is established that *cold* is the most efficient agent in inducing tonic contraction; while the application of moderate warmth causes a relaxation of this contraction. Thus, cold and heat are of extreme value as remedial agents, when the tonicity of the blood-vessels is deficient or excessive.

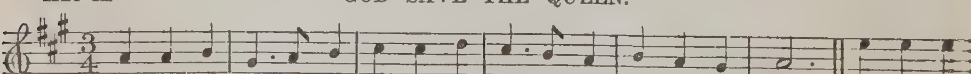
TONICS are medicines which, in cases of want of *tone* or *tonicity* in the muscular fibres, are employed to restore strength and vigour to the system. Tonics, to a certain degree, are stimulants; but while the latter produce a rapid but transitory excitement, the former slowly induce a certain degree of excitement, and the effect is permanent. Most tonics, in which category we must place the shower-bath, cold sea-bathing, open-air exercise, friction, &c., as well as actual medicines of this class, act primarily through the nervous system (iron being, perhaps, the only exception); and secondarily produce their effects upon the muscular system at large. It is not only in general muscular debility that tonics are to be employed, but in all the numerous complaints which follow in its train, as palpitation, convulsions, epilepsy, chorea, neuralgia, and all forms of periodic disease. Amongst the chief medicines of this class are the dilute hydrochloric, nitric, nitro-hydrochloric, and phosphoric acids, various salts of bismuth, copper, iron, silver, and zinc, the various kinds of cinchona bark, with their alkaloids and their salts, cusparia, calumba, cascarilla, chiretta, gentian, quassia, salix, simaruba, and taraxacum. Although nux vomica and its alkaloid strychnine are placed by writers on Materia Medica amongst the 'special stimulants,' when given in very small doses they have a well-marked tonic action; and there is probably no tonic medicine of more general utility than the *Syrup of Iron, Quinine, and Strychnine*, a non-officinal but widely-used preparation, of which every drachm (the ordinary dose) contains $\frac{1}{32}$th of a grain of strychnine.

TONIC SOLFA. Various attempts have been made at different times to introduce a musical notation in which the staff with its lines and spaces is dispensed with. Jean Jacques Rousseau suggested, but afterwards discarded, a notation where the notes of the scale were indicated by the Arabic numerals. A system similar to Rousseau's in its leading features, called the Tonic Solfa, has, through the influence of its principal promoter, the Rev. John Curwen (who obtained his main principles from the writings and practice of Miss Glover of Norwich), been brought into use to a considerable extent in singing-schools in Great Britain. It proceeds on the principle of giving the chief prominence to the fact, that there is in reality but one scale in music, which is raised or lowered according to the pitch of the key. The seven notes of the diatonic scale are represented by the Solfeggio (q. v.) syllables, or rather Miss Glover's modification of them—*Doh, Ray, Me, Fah, Soh, Lah, Te; Doh* standing for the keynote in whatever key the music is written. In the early exercises, the pupils are accustomed to a scale or diagram, called the Modulator, representing pictorially the exact intervals of a key, with the semitones in their proper places. In written music, only the initial letters of the solfeggio syllables are used—d, r, m, f, s, l, t; the higher octaves of a given note being distinguished by a ^{1} above, as d^1, r^1; and the lower by a $_1$ or $_2$ below, m_1, m_2. The name of the key is prefixed to a tune as its signature, as 'Key A,' 'Key B flat'—the keynote being, in all the major keys, *doh*. To indicate rhythm, a perpendicular line | precedes the stronger or louder accent, a colon : the softer accent, and where necessary, a shorter perpendicular line | the accent of medium force. Preparatory to writing the notes, the accent-marks are placed at equal distances along the page—thus, | : | : or : | : : | : : | : or | : | : | : | : A note immediately following an accent-mark, is supposed to occupy the time from that accent to the next—thus, | d : d : d | d : d : d | d, or | d : r | m : d. A horizontal line indicates the continuance of the previous note through another *aliquot* (the term used by Mr Curwen for the distance of time between any accent and the next)—thus, d : — | d : d. A dot divides an aliquot into equal subdivisions, d : m.r | d. A dot after a mark of continuance indicates that the previous note is to be continued through half that aliquot—thus, | d : –. f | m : d. A comma indicates that the note preceding it fills a quarter of the time from one accent to the next—thus, | d : r.m,f | ; a dot and comma together, three-quarters—thus, | f.,m : r.,d. An inverted comma ‘ is used to denote that the note preceding it fills one-third of the time from one accent to the next—thus, : d | s : l‘s‘f | m : r | d. An aliquot or part of it unfilled, indicates a rest or pause of the voice. A line below two or more notes signifies that they are to be sung to the same syllable. We subjoin an example of the tonic solfa shewn alongside of the ordinary notation:



Modulator.

KEY A. GOD SAVE THE QUEEN.



| d :d :r | t_1 :–.d :r | m :m :f | m :–.r :d | r :d :t_1 | d :— :— ‖ s :s :s

| s :–.f :m | f :f :f | f :–.m :r | m :f.m :r.d | m :–.f :s | l‘s‘f :m :r | d :— :— ‖

In modulating into a new key, the note from which the transition is taken is indicated by a combination of the syllabic name which it has in the old key with that which it has in the new—*me lah*, for example, being conjoined into *m'lah;* and in writing this note, the initial letter of its syllable as

a member of the old key, is placed in small size before and above the initial of the syllable of the new, as ^{m}l, ^{d}s. In the case, however, of an accidental, where the transition is but momentary, a sharpened note changes its syllabic vowel into *e*, and a flattened note into *aw*, spelled *a*, as *fah, fe; soh, se; te, ta*. In the minor mode, *lah* is the keynote; the sharp sixth is called *bah*, and the sharp seventh *se*. The signature of the key of A minor is 'Key C, minor mode.'

For a full explanation of this system see Curwen's *Grammar of Vocal Music*, or the periodical called the *Solfa Reporter*. The advocates of this notation maintain that it possesses advantages over the common system, particularly from the distinctness with which it indicates the keynote and the position of the semitones; the cheapness with which it is printed; and the manner in which, they say, it develops the proper mental effects of notes in key-relationship, and employs them in teaching. It has, however, been objected to by others, from its withdrawal of the direct indication of pitch to the eye which exists in the common notation, from its limited applicability to instrumental music, and from its acquirement not being, like that of the ordinary notation, an introduction to the world of musical literature.

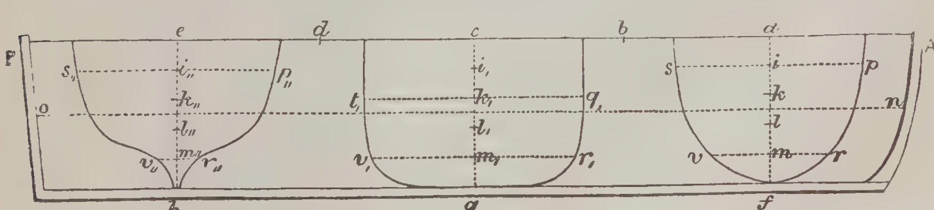
TONKA BEAN, or TONGA BEAN, the seed of *Dipteryx odorata*, a large tree, of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, a native of

Tonka Bean.

Guiana, having pinnated leaves and axillary racemes of purplish flowers. The fruit is an oblong, dry, fibrous drupe, containing a single seed, which has a strong agreeable odour, owing to the Coumarin (q. v.) which it contains, and which is sometimes found crystallised between the cotyledons. Tonka beans are used for flavouring snuff, for which purpose one is carried in the snuff-box; and are put amongst clothes, to preserve them from insects, and to communicate an agreeable odour.

TONNAGE, in regard to ships, is the measure of capacity, the ton being one not of weight, but of cubic content—i. e., 40 cubic feet. Very early in the history of navigation, some scale must have been established by which the relative capacity of different vessels could be determined. In England, there are early laws upon the subject, settling the data upon which the calculation should be made. The present system, called 'New Measurement,' dates from 1835; but the prior system, established in 1719, and now known as O. M. (Old Measurement), still subsists among yachts and some other vessels. The Old Measurement was greatly erroneous, for the actual depth of the ship was not taken into account, but was assumed to be equal to her breadth. The tonnage was then obtained by multiplying together length, breadth, and assumed depth in feet, and by dividing the product by 94. As harbour-dues and such-like taxes were levied according to each vessel's tonnage, it naturally followed under such a system that traders built their ships with as little beam and as great depth as they possibly could. The ships thus became highly dangerous in rough weather, and, moreover, every principle of correct naval architecture was set at nought, to produce deep wooden boxes capable of carrying a maximum of cargo with a minimum of beam. The absurdity of a law by which, in consequence of an inch more beam, a two-decked vessel might appear of greater capacity than a three-decked ship of like length, was so palpable, that many efforts were made at improvement, though without success until 1835.

By the Act of that year, the new system established the depth of hold as a necessary ingredient of the calculation. As, however, the section crosswise of a ship varies so considerably at different points in her keel both in superficies and shape, more than an approximation to her cubic content cannot be attained. To arrive at this approximation, the total length of the upper deck, or, if the ship be not wholly devoted to cargo, of the upper portion of the space for cargo, is taken, and divided into 6 equal parts at the points *a, b, c, d, e*. From the foremost, centre, and aftmost of these points, the depths to the bottom of the hold are measured as *af, cg, eh*. Each depth has to be divided into 5 equal parts; at the fore and after depth, the width inboard of the ship is measured at $\frac{1}{5}$th and $\frac{4}{5}$ths the depth from the top; and the centre-depth at $\frac{2}{5}$ths and $\frac{4}{5}$ths from the top. These lateral measurements at i, $i_{,,}$, $k_{,}$, m, $m_{,}$, and $m_{,,}$, are developed on the plan, and curves drawn representing cross sections of the ship at the given points. All dimensions are sup-



posed to have been taken in feet and decimal parts, and they are thus used in computing the tonnage. The 'length,' *no*, is measured from stem (internal side) to stern-post, at half the height of the centre-depth from the keel. To twice the depth amidships (*cg*), add the depths forward and aft (*af, eh*). The result is the 'sum of the depths.' Add together the two breadths taken at the foremost depth: of the

breadths taken at the centre-depth (cg), add together three times the breadth at $\frac{2}{5}$ths, and twice the breadth at $\frac{4}{5}$ths: of the after-breadths, add together the breadth at $\frac{1}{5}$th, and twice the breadth at $\frac{4}{5}$ths. The sum of these three totals is the 'sum of the breadths.' Having obtained these quantities, the tonnage is approximated to in a somewhat arbitrary manner by the following formula:

$$\text{Tonnage} = \frac{\text{Sum of depths} \times \text{sum of breadths} \times \text{length}}{3500};$$

or, if expressed in terms of the figure:

$$\text{Tonnage} = \frac{\{\, 2cg + af + eh \,\} \ \{\, (ps + rv) + (3t_{,}q_{,} + 2r_{,}v_{,}) + (p_{,,}s_{,,} + 2r_{,,}v_{,,}) \,\} \times no}{3500}.$$

In computing the measurement of a steamer, the same system is followed, but the tonnage of the engine-room (which is supposed to be capable of floating engines and boilers) is deducted from the total to express the tonnage of the ship.

TONNAGE (more properly TUNNAGE) AND POUNDAGE, certain duties on wine and other merchandise, which began to be levied in England in the reign of Edward III. They were at first granted to the crown by the vote of parliament for a limited number of years, and renewed on their expiry. The object of these imposts was said to be, that the king might have ready-money in case of a sudden emergency demanding it for the defence of the realm and the guarding of the sea. Originally fluctuating in amount, tonnage and poundage came to be fixed at 3*s*. on every tun of wine, and 5 per cent. on all goods imported. In the reign of Henry V., they were first conferred on the king for life; and the same course being followed with his successors, the sovereign began gradually to consider them as his proper right and inheritance, and the vote of parliament as but a formality expressive of the popular recognition of his prerogative. Though these duties were not voted to Henry VIII. until the 6th year of his reign, he, notwithstanding, levied them from the date of his accession; and parliament, in voting them, took occasion to blame those merchants who had neglected to make payment. It was, in fact, usual to levy these duties during the period intervening between a sovereign's accession and his first parliament, and this was done by Charles I., as by his predecessors. The Commons, however, in Charles's first parliament, accorded these imposts not for life, but for a year only; and the House of Lords objecting to this departure from previous usages, and rejecting the bill, tonnage and poundage were attempted to be levied by the royal authority alone, a proceeding which raised the opposition of the Commons. Charles was, in 1629, induced to pass an act renouncing the power of levying these or any other imposts without parliamentary sanction. On the Restoration, Charles II. obtained a grant of tonnage and poundage for life; and the same course was followed on the accession of James II. and of William III.; but by three several statutes of Anne and George I. (9 Anne, c. 6; 1 Geo. I. c. 12, and 3 Geo. I. c. 7), these imposts were made perpetual, and mortgaged for the public debt. The Customs Consolidation Act, introduced by Mr Pitt in 1787, 27 Geo. III. c. 13, swept away tonnage and poundage, and all the other then existing changes, and substituted a new and single duty on each article. See CUSTOMS DUTIES.

TONQUIN, the most northerly province of Cochin China (q. v.).

TONQUIN, GULF OF, an arm of the China Sea, bounded by Cochin-China on the W., by China on the N., and by the Chinese province of Quang-tung and the island of Hainan on the E. It is 150 miles in width, and 300 miles in length. The Song-ca and many other rivers fall into the Gulf, and along the coasts are many islands, chiefly, however, small. Extensive fisheries are carried on on the coast; and the fish, besides being largely sold in the interior of the province of Tonquin, are exported in great quantities to China.

TONSILS. See PALATE.

TONSURE (Lat. *tonsura*, a shaving, from *tondeo*, I shave), a religious observance of the Roman Catholic and oriental churches, which consists in shaving or cutting the hair, as a sign of the dedication of the person to the special service of God, and commonly to the public ministry of religion. It is a very ancient usage, and by some writers is represented as of apostolic origin; but that it did not prevail in the early ages is sufficiently plain from the fact with which Optatus upbraids the Donatists of his time (4th c.), of having shaved the heads of certain Catholic priests and bishops in derision. Jerome also, in his *Commentary on Ezekiel*, c. 24, is equally explicit. It would appear that the usage first arose in reference to the monastic rather than the clerical life. Paulinus of Nola, in the end of the 4th, or beginning of the 5th c., alludes to it as then in use among the western monks; and it speedily passed from them to the clergy, the crown-like figure being regarded partly as a symbol of our Lord's crown of thorns, partly as an emblem of the 'Royal Priesthood' of the Christian dispensation. The form of the tonsure was different in different churches, and the varieties of it are of some historical interest. That of the Roman Church, called 'the tonsure of Peter,' consisted in shaving the crown as well as the back of the head, so that there remained a circular ring or 'crown' of hair. This was the form in use in Italy, Gaul, and Spain. In the 'Scottish (or Irish) tonsure,' which was in use in Ireland, in North Britain, and in those parts of Germany in which the Irish missionaries had preached, the entire front of the head was shaved, leaving the front bare as far back as the line from ear to ear. This tonsure was called 'the tonsure of James,' and sometimes of 'Simon the Magician.' The Greeks and other orientals shaved *the entire head.* The supposed derivation of the Irish form of tonsure from the apostolic times, led to its being held both in Ireland and in Britain, as well as other churches of Irish foundation, to be of the most vital importance, insomuch that the introduction of the Roman form was almost the occasion of a schism. Originally, the tonsure was merely a part of the ceremonial of initiation in orders, and was only performed in the act of administering the higher order; but about the 7th c., it came to be used as a distinct and independent ceremonial; and a question has been raised whether it is to be considered as itself an order, and to be added to the list of what are called the 'Minor Orders' (q. v.). The now received opinion of Catholic writers is that tonsure is not an 'order,' but only a 'preparation for orders.'—See Wetzer and Welte's *Kirchen-lexicon*, art. 'Tonsur.'

TONTINE. This term is derived from the name of Tonti, a Neapolitan, who seems to have been the first propounder of a scheme for a financial association of which the prize or prizes were to accrue to the longest liver or livers. Generally, in an association on what is called the tontine principle, a payment is made by each member of the association, and with the capital so formed, an annuity, payable at the same rate until all the lives forming the association are extinct, is bought from some company or individual. This annuity is divided among the members according to age and premium paid by each; and on the decease of any member, the surplus thence arising is divided among the survivors; and on the death of the last member of the association, the total annuity reverts to the source from which it has hitherto emanated. There are, however, various kinds of tontines; and the designation of tontine may, with propriety, be applied to any financial scheme by which it is proposed that gain shall accrue to survivorship. In England, tontines have rarely been resorted to as measures of public finance. The last for which the government opened subscriptions was in 1789.—See Hamilton's *History of Public Revenue*, p. 210. Schemes on the tontine principle seem generally to be acceptable to the public, owing, probably, to the sort of sentimental faith which most persons have in their own prospects of longevity; and to the prudent desire for ease and affluence in old age. The application of the principle by Life Assurance Companies in their mode of distributing 'bonus,' or surplus profits, has long been a subject of controversy among these valuable institutions. It would be impossible here to go into the argument with any degree of nicety. It may, however, be broadly stated as follows: A company formed for the purpose of life assurance means a company in which the members who are lucky in having long life, are to pay for those who are unlucky in dying prematurely. But over and above the net mathematical premium payable by each member of an assurance society, or by each person assured at the risk of a company, a percentage, or 'loading,' as it is technically called, is added, to cover expenses of management and other contingencies. Where the funds of the company or society have been invested with average success, the loading is generally found, at the periodical actuarial investigations, to have been in excess of actual requirements; and the question then arises: How are 'profits,' or, in other words, the overcharges on premiums, to be divided? The question is plainly one of great intricacy. The argument used by the offices favouring the younger policy holders is, that those which favour the older are really acting on a tontine principle, which is the very converse of what ought to prevail in life assurance; on the other hand, it is said that the fulfilment of the insurance contract is provided for by the net premium, and that the distribution of over-payments, as 'profits' really are, is to be determined on principles wholly independent of insurance. See 'Notes on the Early History of Tontines,' by J. Hendricks, in the *Assurance Magazine* for July 1862.

TOOKE, John Horne, a celebrated etymologist and political adventurer, was the son of John Horne, a London poulterer, and was born in that city, June 1736. He was educated first at Westminster and Eton, and afterwards at St John's College, Cambridge, where he took the degree of B.A. in 1758. After spending some time as an usher in a school at Blackheath, he entered the church (to please his father, and strongly against his own wish), and in 1760, became curate at New Brentford. The disgust he entertained for the sacred profession led him to indulge (by way of revenge) in a license of speech and life, which appears to us to have fatally affected the honesty of his character. It is impossible, for instance, to read a passage like the following (from one of his letters to Wilkes), without feeling a deep distrust of the whole man: 'It is true I have suffered the infectious hand of a bishop to be waved over me; whose imposition, like the sop given to Judas, is only a signal for the devil to enter; but I hope I have escaped the contagion; and if I have not, if you should at any time discover the *black* spot under the tongue, pray kindly assist me to conquer the prejudices of education and profession.' When Wilkes (whose acquaintance he had made during a trip to Paris) stood as a candidate for the county of Middlesex, T. zealously aided him, pledging his credit for Wilkes' expenses, and declaring that, 'in a cause so just and holy, he would dye his black coat red;' but he afterwards quarrelled with his dubious associate, and in 1770—1771, the two had a rasping epistolary controversy, which appears to have hugely gratified their enemies. He still, however, continued to meddle in political affairs, and even ventured to encounter (not without success) the formidable Junius. In 1773, he resigned his living at New Brentford, and commenced the study of law, a profession in which he was really fitted by nature to excel. About this time, he rendered some important private service to a Mr Tooke of Purley in Surrey, who designed to make him his heir, but altered his mind, and only left him a legacy of £500. Altogether, however, he is said to have received from this gentleman about £8000, and, in consequence, adopted the surname of Tooke, by which he is now known. In 1775, he was fined and imprisoned in the King's Bench for publishing an advertisement in which he accused the king's troops of barbarously murdering the Americans at Lexington. While in prison, he penned his celebrated *Letter to Mr Dunning*, in which are to be found the germs of his *Diversions of Purley*. It excited a good deal of attention at the time, and even Dr Johnson, who detested T.'s political sentiments, expressed his intention—should he publish a new edition of his *Dictionary*—to adopt several of the 'dog's' etymologies. On his release from confinement, T. made an attempt to gain admission to the bar, but was refused, on the ground of his clerical orders. Soon after, he reverted to political writing, at once the pleasure and the poison of his life, and in a *Letter on Parliamentary Reform*, advocated universal suffrage. In the struggle between Pitt and Fox, he pamphleteered on the side of the former, but soon got to hate Pitt too, as he had learned to hate most other public men. In 1786, appeared his famous *Epea Pteroenta, or the Diversions of Purley*, a work on the analysis and etymology of English words, which, amid much that is erroneous, both in principle and detail, contains still more that is acute, original, and true. In particular, he has demonstrated, says a *Quarterly Reviewer* (No. 14), that 'all words, even those that are expressions of the nicest operations of our minds, were originally borrowed from the objects of external perception.' See Philology. But T.'s passion for politics soon drew him from the calm pursuit of literature into the vortex of public life. In 1790, and again in 1796, he stood as a candidate for Westminster, but was unsuccessful on both occasions. At length, in 1801, the great enemy of rotten boroughs entered parliament for the most notorious rotten borough in England—Old Sarum; but he made no figure there. He died at Wimbledon, March 19, 1812. T. was never married, but had several natural children, to whom he left his property. The best edition of the *Diversions of Purley* is that of Taylor (Lond. 1840).

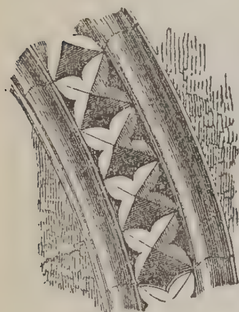
TOOMBUDRA (correctly, TUNGA-BHADRO), an important tributary of the Kistnah or Krishna, rises in the south-west of Maisur (Mysore), and after a north-east course of from 350 to 400 miles, joins the Kistnah, 25 miles below Karnul.

TOON, or **TOONA** (*Cedrela Toona*), a tree of the natural order *Cedrelaceæ*, one of the largest timber trees of India. Dr Hooker mentions one which he measured which was 30 feet in girth at five feet above the ground. The leaves are pinnate, the flowers small, in panicles, with a honey-like smell, the petals erect, and approaching each other so as to form a sort of tube. The tree ascends to the height of 4000 feet on the Himalaya Mountains, and is found to the furthest south of the East Indies. It is sometimes called *Bastard Cedar*. The wood is soft, but is used for furniture. The bark is a powerful astringent, and is used in dysentery, diarrhœa, &c.

TOOTHACHE. See TEETH.

TOOTHACHE-TREE. See ARALIA and XANTHOXYLUM.

TOOTH-ORNAMENT, much used in the Early English style.



Tooth-ornament.

TOP, in a Ship, is the platform at the head of each lower-mast. It is supported on the trestle-trees and cross-trees, and serves to give a wider base to the top-mast shrouds. It is also used for working the upper sails. In a well-ordered ship, there is a captain and crew for each top. Formerly, in vessels of war, the top was fortified with hammocks all round, and in action was made to do duty as a sort of redoubt, whence a fire of small-arms, or even light swivel-guns, was poured upon the deck of the enemy.

TOPAZ, a mineral, ranked by mineralogists amongst Gems (q. v.), and the finer varieties of which are much valued both for their lustre and the beauty of their colours. It is composed chiefly of alumina and silica, the former, in general, more than 50 per cent. of the whole, with fluoric acid, and usually a little oxide of iron. It is found generally in primitive rocks, and in many parts of the world. A crystal 19 ounces in weight was found in the Cairngorm Mountains in Aberdeenshire, Scotland; and fine topazes are sometimes found in that part of Scotland, in Cornwall, and in the Mourne Mountains in Ireland. Fine topazes are found in Ceylon, but those most prized by jewellers are generally from Brazil. The finer varieties of T. are in general found either crystallised, or as small rolled masses, which may have been formed from crystals, in alluvial soil. T. is either colourless, or red, blue, green, or yellow, in great variety of shades. Its crystals are rhombic prisms, generally terminated by four-sided pyramids, but often variously bevelled and acuminated. The prisms are finely striated. The cleavage parallel to the base of the prism is easy. The specific gravity is about 3·5. The lustre is vitreous. T. is translucent or almost transparent on the edges. It is harder than quartz. It is rendered very electric by heat or friction, and by this property a T. may at once be distinguished from a diamond or ruby, for which otherwise, when cut and set, it might readily be mistaken. A coarse variety of T., called *Pyrophysalite*, occurs near Fahlun, in Sweden, which is not crystallised. It is greenish white. When reduced to powder, it can be used as emery for grinding and polishing.—T. derives its name from the *Topazion* of the ancients, which, however, seems to have been a totally different mineral.

TOPE (*Galeus canis*), a small species of shark, of the family *Galeïdæ*, which has two dorsal fins and one anal, spout-holes, and the eyes furnished with a nictitating membrane, the first dorsal situated over the space between the pectorals and ventrals. The T. is very abundant on the southern coasts of Britain, but becomes more rare towards the north. The name T. is said to be originally

Tope (*Galeus canis*).

Cornish. Other local names are *Miller's Dog* and *Penny Dog*. It attains a length of about six feet. The T. is extremely troublesome to fishermen, robbing their lines of the fish which are attached to them, and biting off the hooks, or, if it happens to be itself hooked, often winding the line round its body in many coils and with tangled knots.

TOPE is the vernacular name of Buddhistic monuments intended for the preservation of relics. In Ceylon and elsewhere, they are also called *Dagops;* and another of their designations is *Chaitya*. The difference between these terms results from their meaning. Tope is the Pâli *thûpa*, and the Sanscrit *stûpa;* it means therefore literally 'accumulation,' and conveys a sense analogous to that of the Latin *tumulus*. *Dagop* is a corruption of *dhâtu-gopa*, i. e., relic-preserver; and *Chaitya* applies generally to objects of worship, as images, temples, sacred trees, &c. *Tope* is therefore the name of those monuments in regard to their shape; *Dagop*, in regard to their purpose; and *Chaitya* the general term. Though the shape of the topes underwent many changes according to time and locality, it is possible to distinguish its oldest type from its later development. The oldest topes are in the shape of cupolas, generally spherical, but sometimes elliptical, resting on a cylindrical or quadrangular, or polygonal base, which rises either in a straight or inclined line, or in terraces. The top of the cupola, surrounded by a balcony of pillars of a peculiar kind, is crowned by a structure generally quadrangular, but sometimes in the shape of a reversed pyramid of a few steps; and over this structure is a roof in the shape of an extended parasol (Sanscrit, *chhattra;* in Pâli, *chatta*). This was the form, for instance, of the topes of Sanchi, of the dagops of Ceylon, and the oldest monuments of this kind in the Punjab and Afghanistan; though in most of them the parasol, being of wood, is either completely destroyed, or merely recognisable in its fragmentary condition (see art. BUDDHISM, where in the section of the cave-temple at Karli, the tope is seen still surmounted by the wooden umbrella). The cupola was sometimes

ornamented with more than one parasol; in some of the topes of Sanchi there are three, and even five parasols side by side, the middle one exceeding the rest in height. The different arrangement of these parasols, especially when their number increased,

Fig. 1.—View of principal Sanchi Tope.
(From Fergusson's *Hand-book of Architecture.*)

led to a different shape of the topes, such as occurs, for instance, in China and Tibet. This arrangement consists in placing them one *over* the other; and not only three or five, but even seven, nine, or more are so placed. The height of the structure thus became naturally greater than it originally was, and the topes, instead of having the character of cupolas, now assumed that of pyramids resting on a cupola

Fig. 2.
Rock-cut Tope at Ajunta (from Fergusson), in which the three umbrellas have become a spire.

base, the parasols gradually giving way to a real pyramidal form. In some monuments of this class, however, the cupola was placed above, when the base consists in round or quadrangular towers rising in a spiral form, or in several stories. The Chinese, on the contrary, rejected the cupola altogether, and merely retained the succession of parasols extended one over the other, converting them into a many-storied tower; and the same is the case with the topes of the Mongols, the *Ssuvurghans*, which are pyramids erected on a low quadrangular base. The top of the pyramidal topes always carries some metal ornament, frequently gilt, resembling a parasol, or a needle, or a trident, or a rising flame. The height of these buildings varies from a few feet to 300, and even more; there are also topes of a few inches only, but they serve merely as ornaments in temples or buildings, or as symbols of the real topes. If erected in cave-temples, the tope generally stands at the end of a long hall especially cut out for it, but sometimes also in the sanctuary of the cave-temple itself; if erected over-ground, it stands always in the vicinity of a temple or convent. In the interior of the tope is the cell or chamber (*dhâtugarbha*) where the box containing the relics and 'the seven precious things' was placed. This cell consists of six slabs of stone, firmly closed after the box with the relics, &c. had been placed in it; and it was immured into the tope after its structure had, in the course of building, attained a certain height; the building then being brought to its completion, so that the cell enshrining the relic was enclosed on all sides with solid brickwork. The 'seven precious things' referred to, with which the relics were ornamented, are differently enumerated; according to one account, they are gold, silver, lapis lazuli, crystal, red pearl, diamond, and coral; others mention ruby and emerald; and others, again, omit gold and silver. In several cells which have been opened, the box contained, besides the relics, precious stones of various kinds, golden ornaments, and coins; and the box itself generally consisted of an outer casement of stone, clay, or bronze, which enclosed a silver cylinder, and within this, a golden cylinder, which was the real receptacle of the relics. Both cylinders had generally a convex lid, representing the shape of the cupola, and the box exhibited inscriptions commemorating the name of the saint to whom the ashes or other relics contained in it had belonged. It seems that there are also topes which had the relics placed, not within, but under them—or, in other words, in the ground on which they were erected; for, in some which were opened, neither a cell nor any relic was found; and though it is possible that such monuments were merely erected in commemoration of some personage, there are, on the other hand, accounts which relate that relics were also placed under the dagops. Whether these accounts be correct, it is at present impossible to say, as no foundation on which such dagops stand has as yet been explored. It has been supposed by some authors that the topes contained some secret passage leading to the relic-cell, known only to the priests or the initiated, who thus might gain access to the relics; for legends relate that during night such relics occasionally shed light, and that some pious king was deigned worthy of being favoured with their sight; but none of the topes hitherto explored—and some of these are of the greatest dimensions—yielded any confirmation of this theory; they proved to be nothing but solid masses of brick and stone, without any chambers or passages—merely containing the relic-cell, of generally one foot in diameter. That the cupola of the topes was intended to represent the water-bubble, the Buddhistic symbol of the hollowness and perishability of the world, is borne out by a legend in the *Mahâvans'a* (q. v.). The purport of the parasol may seem more

doubtful; but as the parasol is the emblem of Hindu royalty, and as S'âkyamuni, himself the son of a king, replied to the question how he wished to be buried, by answering: 'Like an emperor,' it is not unlikely that the parasol of the topes was intended to imply the royal dignity possessed by a Buddhistic saint. When the topes became pyramids or towers consisting of terraces and stories, the number of the latter had likewise a symbolical import. Thus, only the topes of the most accomplished Buddhas had thirteen terraces, to shew that these Buddhas had passed beyond the twelve causes of existence; three terraces imply the three worlds—the world of desire, that of form, and that of absence of form; five, the five steps of Mount Meru; and so on.—See C. F. Koeppen, *Die Religion des Buddha* (Berlin, 1857), vol. i. p. 533, ff., and the works quoted there.

TOP-GALLANT, in a Ship, the name applied to the third mast or sail above the deck, i. e., to the mast and sail next above the topmast and topsail respectively.

TO'PHANÉ (correctly, TOP-HANEH), a suburb of Constantinople, forms a continuation of Galatea along the northern shore of the Bosporus. See CONSTANTINOPLE.

TOPICS (the Greek term *topike*, from *topos*, a place) was the name given by the Greek and Roman rhetoricians and grammarians to the art of discovering arguments. It consisted in the eliciting out of the series of particulars certain general conceptions and propositions, which, in the elaboration of oratorical discourses, served as guides in the invention and choice of suitable arguments. Any one such general conception was called in Greek *topos;* in Latin, *locus communis* (a 'common place'). The Greeks bestowed much attention on this art; among the Romans, Cicero composed *Topica*, and various other treatises of a kindred nature. During the middle ages, it was proposed to apply it to the whole circle of human knowledge, and even to the solution of the most difficult intellectual problems; but, in general, these efforts only resulted in empty exhibitions of mental vivacity (*jeux d'esprit*); and in modern times, the so-called 'art' has sunk so low, that by the term 'topic' one understands nothing more than a theme or subject for discussion and talk.

TOPKNOT, the popular name of some small fishes of the same genus with the Turbot (q. v.) and brill. MULLER'S T. (*Rhombus hirtus*) is not uncommon on some parts of the British coast, particularly the west coast of England. BLOCH'S T. (*R. punctatus*) is more plentiful in more northern parts. They are very similar, brown and mottled with very dark brown or black on the upper surface, white below. They live among rocks, where they are not easily distinguished by the eye from the sea-weed. Although very delicate fish, they are little regarded, the largest being seldom more than 7 or 8 inches in length. The breadth is about half the length.

TÖ'PLITZ, or TEPLITZ, a watering-place of Bohemia, perhaps the most celebrated of the German spas, is pleasantly situated on the Saubach (Pig's Stream), 16 miles north-west of Leitmeritz. The chief building is the palace of Prince Clary, to whom the town in great part belongs; and behind this building are a park and gardens, which are the principal places of resort. Within their limits are the theatre and the Gartensaal, the latter of which serves the purposes of reading, dining, and ball room. On the hill behind the palace is the Schalckenburg, a sort of tavern, built in imitation of a castle, and which commands a wide view from its prospect-tower. The baths are supplied from 11 hot alkalo-saline springs, the chief of which has a temperature of 120° F. They are taken exceedingly hot, and have great virtue in restoring persons afflicted with gout, rheumatism, &c. Pop. of T., 4000, which rises to 10,000 during the months of July and August.

TOPO'GRAPHY is literally a description of places (Gr. *topos*, a place), as rivers, hills, woods, but more especially cities, roads, bridges, streets, and even particular buildings. It differs from ordinary geography only in being more special and minute. Thus, we have topographical descriptions of counties, provinces, and kingdoms, excellent specimens of which are Lewis's *Topographical Dictionary of England*, and Murray's *Hand-books* of English counties and continental kingdoms.

TOPOGRAPHY, MILITARY. Among the first necessities of a military commander is a thorough knowledge of the physical conformation, the obstacles, and the resources of the country in which he has to operate. It frequently happens that the field of warfare is one of which no careful survey is procurable. It devolves, then, on the officers of the staff to make their chief acquainted with all the particulars he requires; hence, topographical drawing is made a principal ingredient in the course of study at the Staff College. These surveys devolve, in the field, on the quartermaster-general's department. An officer of this service is expected to traverse a country with rapidity, to measure distances by eye or intuition, to note them roughly down as he rides, to obtain a rough knowledge of hills and valleys, of roads and ravines, rivers and the means of crossing them. He must at the same time make himself acquainted with the means of sustenance produced by the country, with the feelings of the people—whether friendly or hostile—with the transport which can be drawn from the villages, with the position and strength of fortified places, and, in short, with every particular which can be of service to his commandant. His reconnaissance finished, not without fatigue and danger, he is expected to sit down and produce an eye-map, or a full report of all he has seen and heard.

The *Topographical Department* is a department of the War Office under the 'Director of Surveys,' who is an officer of engineers. It comprises the 'Ordnance Survey,' which is charged with the various national surveys; and the Topographical Dépôt, a collection of maps, plans, descriptive-books, and journals of staff-officers from all parts of the globe. The officers of this dépôt always try to keep their information posted up to the latest date, that, on an army taking the field, the general may at once be put in possession of a competent knowledge of the country he is to pass through or occupy.

TOP-SHELL. See TROCHIDÆ.

TOR (Celtic), 'a projecting rock, is found in the names of Mount Taurus and the Tors of Devonshire (Yes Tor, Brent Tor, &c.) and Derbyshire (Mam Tor, Chee Tor, &c.). The higher summits of the *Tyr*-ol are called Die *Taur*-en.'—Taylor's *Words and Places.*

TORBANEHILL MINERAL, a name sometimes popularly given to a mineral substance also known as BOGHEAD COAL, found on the lands of Boghead and Torbanehill, near Bathgate, Scotland, and celebrated for its value as a source of Paraffin Oil or Naphtha (q. v.), of which it yields a much greater quantity than any other coal or shale found

in Britain. Large quantities are exported to the continent of Europe. A famous litigation took place in 1853 concerning this mineral, between a landlord and the lessees, which turned partly on the question, whether it ought to be regarded as a coal or a shale, a point on which opposite opinions were expressed by eminent men of science.

TORCE, or WREATH, in Heraldry, a garland of twisted silk, by which the crest is joined to the helmet. A crest is always understood to be placed on a torce, unless where it is expressly stated to issue out of a coronet or chapeau.

TO'RGAU, a town of Prussia, and a fortress of the second rank, stands on the left bank of the Elbe, 70 miles south-south-west of Berlin, and 12 miles north of the frontier of the kingdom of Saxony. The river is here crossed by a bridge 500 paces in length, and supported upon 15 stone piers. Among the public buildings are the castle, now used as a barrack and magazine, and comprising a church consecrated by Luther in 1544; a town-church, with pictures by Cranach; a gymnasium, with 300 pupils, instructed by 13 professors. Hops and vegetables are largely raised in the vicinity. A battle was fought here in November 1760, in which Frederick II. of Prussia defeated the Austrians. Pop. 10,762.

TO'RGET, a small island off the north-west coast of Norway, in lat. 65° 30′ N. It serves as a landmark to sailors, is the haunt of numerous waterfowl, but is chiefly noteworthy for its lofty rock called Torghatten (the Hat of Torget), which rises to the height of 756 feet above sea-level, and is pierced right through, near the top, by a cave or passage 80 feet wide, and 1300 feet long.

TORLONIA, a princely Roman family, remarkable for their wealth, and for their extraordinarily sudden rise from the very lowest condition, trace their origin to a poor 'cicerone,' Giovanni T. (born in 1754), who hung about the Piazza di Spagna in Rome, and gained a precarious living by shewing visitors over the Colosseum. By steadiness and honesty, he obtained a reputation in his profession, became afterwards an agent of the French emissaries who were sent to excite the Roman populace to revolution, and on the failure of this project was left with considerable funds in his hands; he afterwards married a widow of means, and became a merchant, gradually rising, by dint of great intelligence, keen foresight, and enterprise, to the position of a stockbroker, usurer, and money-dealer; and by acquiring mortgages over the properties of the impoverished Roman princes, and by various other happy ventures, ultimately amassed an immense fortune. He was made a grandee of Spain, and Duke of Bracciano by the pope. His three sons have allied themselves with princely families of the highest rank; the two younger (the eldest succeeding to the dukedom) carry on their father's business, and are rapidly taking rank among the extensive landed proprietors of Central Italy.

TO'RMENTIL (*Tormentilla*), a genus of plants of the natural order *Rosaceæ*, sub-order *Potentilleæ*, differing from *Potentilla* (q. v.) only in the 4-parted calyx and corolla, and now united with it by many botanists. The COMMON T. (*T. officinalis*, or *Potentilla tormentilla*) is a very common plant in moorish and heathy places in Britain and throughout great part of Europe. It has a large woody root, which has long been officinal, being an agreeable and efficacious astringent, useful in diarrhœa and other complaints; and which contains tannin, gum, and a red colouring matter, not soluble in water, used by the Laplanders for staining leather red. The leaves are ternate, the leaflets lanceolate, and inciso-serrate; the stems ascending and

Tormentil (*Potentilla tormentilla*).

forking, the flower-stalks axillary and terminal and the flowers yellow.

TO'RMINA is the technical term for *griping* pains in the belly.

TORNA'DO. See WHIRLWIND.

TO'RNEA, a river, important as forming part of the boundary-line between Russia and Sweden, rises in Lake Tornea, in Sweden, and flows south-east and south between Russia and Sweden, entering the Gulf of Bothnia at its northern extremity, after a course of 250 miles. At its mouth is the small town of Tornea (q. v.).

TORNEA, a town in Finland, situated in 65° 50′ N. lat., and 24° 10′ E. long., on the peninsula of Svensar, at the mouth of the Tornea, in the government of Uleaborg. The pop., which is about 800, is principally engaged in the exchange-trade with the more northern and scantily-inhabited districts of Finland and Sweden, of which T. is the active centre, as the most northerly town in the Russian Empire; deals, salt-fish, tar, hemp, reindeer skins and other peltries being brought to T., to be exchanged for tobacco, spirits, manufactured goods, &c. T. is often visited in summer by travellers, anxious to witness the singular spectacle of the sun remaining above the horizon both night and day at the summer solstice. T. was several times taken by the Russians from Sweden before its final cession at the Peace of Fredrickshamm, in 1809, when it was ceded, together with the whole of Western Finland, to Russia.

TO'RO, or TORRO, an ancient but decayed town of Spain, in the modern province of Zamora, stands on the right bank of the Douro, 21 miles east of Zamora. It contains numerous religious houses, most of which have been allowed to fall into a state of decay; there are brandy-distilleries and brick and tile works. Pop. 7000.

TORO'NTO, the capital city of the province of Ontario, stands on the north shore of Lake Ontario, in lat. 43° 39′ N., long. 79° 23′ W., 165 miles from Kingston, and 323 miles from Montreal. It is over two miles in length between east and west, is bounded on the S. by the Bay of Toronto, a spacious inlet of Lake Ontario, and is a mile and a half broad from south to north. The scenery of the vicinity is somewhat tame, and the situation of the town is low and flat, the most elevated quarter—the Queen's Park in the west, containing the university, observatory, and handsome private residences—being only from 100 to 200 feet above the level of

the lake. The harbour or bay, about five miles long and a mile in width, is formed by a curving spit of land running into the lake in a south and west direction to the distance of three miles. It is capable of accommodating the largest vessels that navigate the lakes, and is defended at the entrance by a fort, which was thoroughly repaired in 1864 by the imperial government, and mounted with the most efficient modern ordnance. T. has much the appearance of an English town, and is distinguished for the number of its churches—many of which are surmounted by handsome spires. The principal are St James's Cathedral (Anglican), a noble edifice in Early English, erected in 1852; St Michael's Cathedral (Roman Catholic); Knox's Church, with a beautiful spire, and Cooke's Church, both belonging to the Free Church; and the Unitarian chapel. T. is the fountain-head of the Canada school-system, and its educational institutions are numerous and well appointed. The university, charmingly situated in the well-wooded Queen's Park, was inaugurated in 1843, and is attended by 250 students; Trinity College has about 100 students; and the Upper Canada College has 200. There are also the Normal and Model Schools, in the first of which teachers exclusively are trained. Attached to the university is the observatory. There are many benevolent institutions, as hospitals, asylums, &c. Osgood Hall, an elaborate and beautiful building, is the seat of the superior law-courts of Upper Canada. T. is a station for five railways, the Grand Trunk, running east and west, the Great Western, the Northern, the Toronto and Mipissing, and the Toronto, Grey, and Bruce; while, during open navigation, magnificent steamers ply in all directions on the lake. Cabinet-ware and iron rails are manufactured, and foundries, distilleries, and flour-mills are in operation; the exports are manufactured lumber, flour, wheat, and other grain. In 1872, the exports amounted in value to 2,201,814 dollars, the imports to 13,098,133 dollars. Forty-one newspapers and periodicals are published in Toronto, viz.: 4 daily, 15 weekly, 5 semi-monthly, 15 monthly, 1 quarterly, and 2 annually. The city is well supplied with water and lighted with gas. Real and personal property (1872) $32,644,612. Pop. in 1817, 1200; in 1830, 1677; in 1852, 50,763; and in 1881, 86,415.

The name T. is supposed to be of Indian origin, but the meaning of the word appears to have been lost. The town was founded in 1794 by Governor Simcoe. It was incorporated in 1834, was burned by the Americans in 1813, and suffered severely in the insurrection of 1837, on which occasion it was the headquarters of the rebellion, as also from fire in 1849.

TORPE'DO, a genus of fishes of the order *Raiiæ* (see RAY), and family *Torpedinidæ*. All the

Torpedo (*Torpedo vulgaris*).

Torpedinidæ were formerly included in this genus, itself originally formed from *Raia*; but it has been divided into a number of genera, as *Torpedo*, *Narcine*, *Astrape*, &c. The *Torpedinidæ* have a short and not very thick tail, cylindrical towards the end, keeled on the sides. The disc is rounded, and has neither scales nor prickles. The most remarkable characteristic, however, is the galvanic battery, which all the species possess, and which is described and figured in the article ELECTRICITY, ANIMAL. The name T. is very commonly extended in a popular sense to all the *Torpedinidæ*. Two species of T. are occasionally found on the southern coasts of England—*T. vulgaris* or *marmorata*, which sometimes attains a large size, weighing 100 lbs.; and *T. Nobiliana*, which is apparently more rare. They are readily distinguished by the spiracles behind the eyes, which are round and fringed at the edges in the former, oval and perfectly smooth in the latter. These and other species are found more plentifully in the Mediterranean, and the *Torpedinidæ* generally belong to the warmer seas. The popular names *Numb-fish*, *Cramp-fish*, and *Cramp Ray* are given to torpedos by English fishermen. The electric shock which a large T. gives when seized is so severe, that no one who has experienced it desires to experience it again.

TORPEDO. During the war between Great Britain and the United States in 1812—1814, this name was applied to certain mysterious boats invented by Fulton and other Americans for the purpose of navigating beneath the surface of the water, and injuring the bottoms of hostile vessels. In those days of hand-to-hand naval war, these designs (which, by the way, were failures) were looked upon as little less than diabolical. The progress of destructive weapons during half a century has removed this aversion, and nations do not scruple now to employ similar unseen agents for offence and defence. The modern torpedo is really a stationary bomb-shell, intended to explode under the bottom of an enemy's ship. The weapon was first used by the Russians in the Baltic in 1854; and in the American War of Secession of 1861—1865 it was employed extensively, and often successfully. The damage effected by a torpedo exploding beneath a ship is very great; and although the failures are very frequent by the explosion happening at a wrong moment, the danger from torpedoes is considerable in fact, and far more in apprehension, for sailors naturally dread navigating waters where destruction lurks at unknown points concealed from view. There are several varieties of torpedoes, but they may be divided into two classes: those which are self-explosive on a ship touching them, and those which are dependent on an electric current supplied from the shore. The second are the safest for friendly vessels; but they are rather uncertain in action, and can only be employed at a moderate distance from the shore. The first are more certain in action, as they can only explode on a ship being somewhere in contact, but they attack indiscriminately friend and foe.

A torpedo of the self-acting class is shewn in fig 1: *abc* is a hollow iron cone, water-tight, with a ring at *b* by which to anchor it. The upper part, B, is left empty, for the sake of buoyancy, while the lower end, A, is filled with gunpowder, the charge varying from 100 to 300 lbs. At the top of the powder is an iron case, C, filled with lime, and in it a tube of thin glass, D, containing sulphuric acid. The upper part of the glass tube is enveloped by the ringed end of the iron rod, E, which passes through the top of the torpedo, and some distance above it. This rod moves on a joint at F; and to make it more sensitive, while at the same time extending the area of operation, the horizontal rods, G, called feelers, are attached rigidly to its upper extremity

When a ship impinges on the feelers, G, the rod E is deflected from the perpendicular; the ring at

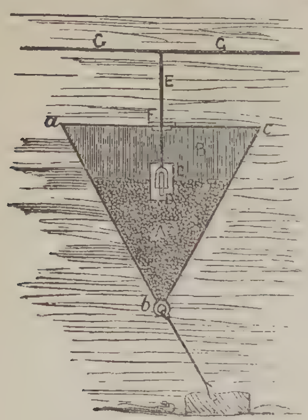


Fig. 1.

the lower end breaks the glass tube D; the acid acting chemically on the lime, generates great heat, and explodes the powder.

Fig. 2 shews an electric torpedo. As before, A is the powder, B empty. Two wires are laid along the

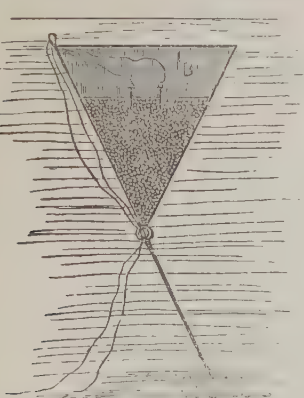


Fig. 2.

bottom of the water from the shore, passed through the ring below the cone, and brought in at the top to two knobs on the upper part of the powder-keg. Between these, a piece of platinum wire passes through a sensitive cartridge. As soon as the circuit of electricity is completed on shore, the platinum becomes incandescent, and the explosion takes place. To ascertain the right moment at which to complete the circuit, elaborate observations are necessary from the shore, as in fig. 3. Two observers at A and B direct their attention to two distant marks, *a* and *b* respectively. At each station (A and B) there is a break in the circuit of the wire, *ccc*. At the point C, where the lines of observation intersect, the torpedo is carefully moored. This point is, of course, selected as one over which, from the run of the channel, there is a strong probability that the ship to be destroyed will pass. Now, let an enemy be passing up the channel. The moment A sees him on his line A*a*, he completes the connection at A, and keeps it complete while any part of the vessel is on the line. Similarly, B completes while the ship is over the line B*b*. If these connections subsist at the same moment, the torpedo is blown up, and the chances are the ship will b over it at the same instant. An ingenious application of the electric current to a self-acting torpedo has been proposed. One wire comes from the battery to the torpedo, but is only left unbroken when an enemy's ship is near the required spot. This wire is led down through a platinum wire in the powder to the outside of the case C (fig. 1), in

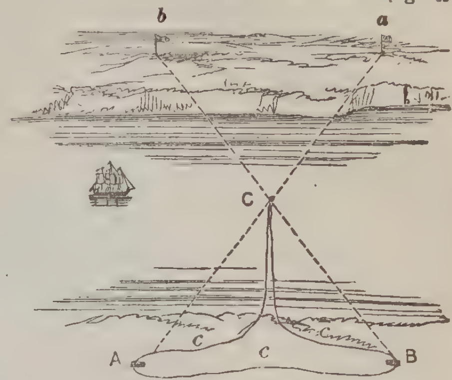


Fig. 3.

which there is neither lime nor acid. When the rod E is deflected, its lower end touches the case, completing the electric connection with the water, and by means of the water, completing the circuit, when the incandescence of the platinum (as in fig. 2) causes the explosion. This instrument has the double advantage of being fired by the ship's contact, and at the same time of being rendered harmless when desirable merely by disconnecting the wire from the battery. The first and last of the torpedoes described above present great difficulties when it is sought to remove them.

TO'RQUAY, a celebrated watering-place on the south coast of Devon, occupying a retired and capacious cove on the north side of Tor Bay, 23 miles from Exeter, and about 210 from London. The name is derived from the Celtic 'Tor' (q. v.), a hill, which occurs in the appellations of the neighbouring peaks of Dartmoor (Hey Tor, Rippon Tor, &c.), and thence is given to the bay, to which these serve as a landmark, and to the ancient parish of Tor Mohun or Tormoham, in which T. is situate. The monastery of Tor Abbey was founded in the 12th c. by Reginald Brewer, then the lord of the manor. Some remains of the original monastic building are still found on the site. The town of T. is of recent origin, and affords a striking instance of rapid growth. The bay is noted in history as the place where William of Orange landed in 1688, and was often used as a naval rendezvous during the war with France; but till the beginning of the present century, T. was little more than an assemblage of fishermen's huts. About that time, the advantages of its climate—which are a peculiarly sheltered position, an equable temperature, and freedom from fogs—caused it to be resorted to by consumptive patients; and it soon attained a European celebrity, which is still almost unrivalled. The romantic hills and valleys of Tormohun and its environs are being rapidly overspread with villas, gardens, terraces, and rows of smaller dwellings. The original parish has been divided into four, and possesses six (English) churches, one Roman Catholic, one Scotch Presbyterian, and numerous dissenting chapels. A stone pier was built in 1803, and the port is resorted to by

colliers and small traders. The present high-road to Newton-Abbot was made about 1825; and the first station of the South Devon Railway was opened in 1845. The geological formation consists mainly of a range of transition limestone cliffs in strata much contorted, forming an excellent building material; and in some places, as at Petit Tor, presenting beautifully-tinted marbles, which are extensively worked. The limestone gives place at some points to Old Red Sandstone, which gives its predominating colour to the soil, and to argillaceous shale in beds of considerable thickness. The scenery is of the most varied and picturesque description. Besides the mildness of the winter, the vicinity of the sea in front, and of Dartmoor in the rear, greatly moderates the summer climate, so that while the mean winter temperature is 44°, being 3° above that of Greenwich, that of the summer is only 55°, nearly 1° below that of Greenwich. The pop. has increased from under 1000 in 1801 to over 32,900 in 1881. Kent's Cavern, discovered in 1824, and the Brixham Cave, discovered in 1858, are rich in fossils, and are among the earliest places in the kingdom in which prehistoric human remains have been found.

TORQUES (Celtic, *torc;* Lat. *torqueo*, I twist), a species of gold ornament, meant to be worn round the neck, which was much in use in ancient times, both among Asiatic and North European nations. It consisted of a spirally-twisted bar of gold, bent round nearly into a circle, with the ends free, and terminating in hooks, or sometimes in serpents. These ornaments seem to have formed an important part of the wealth of those who wore them, and of the plunder obtained by the Roman conquerors from a Celtic or oriental army. A monument erected to a Roman soldier not unfrequently specified the number of torques that had been conferred on him. Numerous examples of the torques have been dug up in Great Britain and Ireland, as well as in France, and are to be found in different archæological collections. Both in Europe and in Asia, the torques resembled one form of Bracelet (q. v.) on a larger scale.

TO'RRÉ DEL GRE'CO, a city of Southern Italy, at the base of Vesuvius, 7 miles from Naples. Its pop., which once numbered 15,000, is, since the last two eruptions, reduced to 5477 (1861). The town is always new, being from time to time destroyed by the lava, and always raised again from its ruins, by the attachment of its inhabitants to their native soil. The soil is fertile, producing fruit and wines similar to those of Greece. Its inhabitants are engaged in the tunny, oyster, and sardine fisheries. Mention is made of the town under its present name (the origin of which is unknown) as early as 1324 A. D. It suffered much in the eruption of 1631, and in that of 1795 it was totally destroyed. T. del G. rose again from its ruins; and although it suffered in subsequent eruptions, especially in those of 1804 and 1822, it has never again been entirely destroyed by the lava.

TO'RRÉ DELL ANNUNZIA'TA, a fortified town of Southern Italy, 13 miles south-east of Naples, stands on the southern base of Mount Vesuvius, 13 miles south-east of Naples. Its chief features are the barracks, the royal arms-factory, and the thermal springs on the sea-shore, close to the town. A fishery and an active coasting-trade are carried on. Pop. 15,500.

TO'RRES STRAIT lies between North Australia and Papua or New Guinea, in lat. 9° 20′—10° 40′ N.; and long. 142° 30′ E. The channel is about 80 miles in width; and its navigation, though practicable, is rendered dangerous and difficult by the innumerable shoals, reefs, and islands with which it is strewn. It was discovered by Torres in 1606.

TO'RRES-VE'DRAS, a town of Estremadura, kingdom of Portugal, on the left bank of the Sizandro, about 30 miles north of Lisbon. It has a pop. of about 3300, and carries on some trade in wine; but derives its reputation solely from having given name to those famous lines of defence within which Wellington took refuge in 1810, when he found it impossible to defend the frontier of Portugal against the French armies; and from which, in the year following, he issued on that career of slow and hard-won victory, which ended in the expulsion of the French from the Peninsula. The *first*, or outermost of these lines, extending from Alhandra, on the Tagus, to the mouth of the Sizandro, on the sea-coast, and following the windings of the hills, was 29 miles long; the *second* (and by far the most formidable) lay from 6 to 10 miles behind the first, stretching from Quintella, on the Tagus, to the mouth of the St Lorenza, a distance of 24 miles; the *third*, situated to the south-west of Lisbon, at the very mouth of the Tagus, was very short, being intended to cover a forced embarkation, if that had become necessary. The entire ground thus fortified was equal to 500 sq. miles.

TORRICELLI, EVANGELISTA, a celebrated Italian mathematician and philosopher, was born at Piancaldoli in the Romagna, Italy, October 15, 1608. He was brought up by an uncle who resided at Faenza, and who put him under the tuition of the Jesuits. When 20 years old, he was sent to Rome, and there devoted himself to mathematical studies. Galileo's theories on force and motion, which had been published a short time before, especially engaged his attention, and led to his publishing a *Trattato del Moto* (1643), a meritorious work, but containing few new discoveries of consequence. The publication of this work led to his being invited by Galileo to visit him; and on the old philosopher's death, three months afterwards, he was appointed to succeed Galileo in the chair of Philosophy and Mathematics at Florence. Here he resided till his death in 1647. The discovery which will preserve T.'s name through all ages was the interpretation of the previously known fact, that water will rise in a suction-pump only to the height of about 32 feet. The fact that water *could* be raised in a pump was expressed by the empirical law, that 'nature abhors a vacuum,' and after the limit of 32 feet was ascertained, the law was modified accordingly by Galileo. T., wishing to perform this experiment more conveniently, employed mercury, and found that nature's abhorrence of a vacuum varied for different fluids, and was represented by a column of fluid in height inversely proportional to its specific gravity; here, then, was an additional fact of importance, containing the clue to the mystery, and T. was not long in hitting on the idea that the column of fluid was sustained by the pressure of the atmosphere on the open surface of fluid. See BAROMETER. T. also effected the quadrature of the cycloid, but in this was anticipated by Roberval.

TO'RRINGTON, a municipal borough and market-town of the county of Devon, on an eminence sloping to the Torridge, 10 miles south-south-west of Barnstaple. The inhabitants, who slightly increased in numbers between the years 1861 and 1871, are employed for the most part in agriculture and glove-making; but the industry is inconsiderable. Pop. (1881) 3445. The name of T. emerges frequently during the great Civil War; and the capture of the town by Fairfax in 1646, on which occasion the church, with 200 prisoners, and

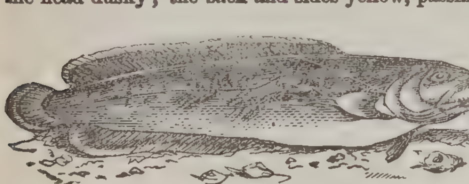
those who guarded them, were blown into the air by gunpowder, proved fatal to the king's cause in the west.

TORSHO'K, one of the most ancient towns in Russia, in the government of Tver, stands on the Tverza, in an undulating district, 309 miles south-east of St Petersburg. Leather and malt are the most important branches of manufacture; but the gold and silk embroideries of this town are well known throughout the empire, and obtained much celebrity at the London Exhibitions of 1851 and 1862. There is an extensive trade in corn, which the merchants of T. purchase in the neighbouring districts and at the landing-places of the Lower Volga, and thence transport to St Petersburg by water. Much of this corn is ground at T., and the flour exported. The town was founded in the 11th century. Pop. 16,240.

TO'RSION is a method of common application in surgery for the purpose of checking arterial hæmorrhage in certain cases. The wounded vessel is drawn out and fixed by a pair of forceps a quarter of an inch from the end; the end of the artery is then twisted round till it will not untwist itself. It is especially useful when there are many small arteries wounded in an operation, as, for example, in the extirpation of a large tumour.

TORSION-BALANCE (Lat. *torsio*, twisting) is an instrument first invented by Coulomb, in which the force exerted by a twisted thread or filament to recover its original position, is made the means of measuring small degrees of electrical and magnetical attraction. See ELECTRICITY, fig. 9. It has also been used in determining the mass and density of the earth. See EARTH.

TORSK or, by corruption, TUSK (*Brosmius vulgaris*), a valuable fish of the family *Gadidæ* (q. v.), abundant in the northern parts of the Atlantic Ocean. The genus is characterised by a single long dorsal fin, and by having the vertical fins separate. The T. is from 18 inches to 2 feet, rarely 3 feet long; the head small, the body moderately elongated, one barbule under the chin, the dorsal and anal fins distinct from the tail, although separated from it by a very short interval; the tail rounded; the head dusky; the back and sides yellow, passing



Torsk, or Tusk (*Brosmius vulgaris*).

into white on the belly. It lives in deep water, approaching the land in shoals only at the spawning-time, which is very early in the year. It spawns among the sea-weed of the coast. It is caught in the same manner as cod, ling, &c.; and although rather firm and tough when fresh, is generally esteemed, when dried and salted, to be the best of stockfish. It belongs to northern regions, and is very abundant in the Shetland Isles, on the coasts of Norway and of Iceland. Another species is found on the coasts of New England, while an ally (*Brosmophycis marginatus*) is common on the Pacific shores.

TO'RSO (Ital.), strictly, signifies a trunk, e. g., the trunk of a tree, but is specially applied to an ancient statue of which only the body remains. Of such imperfect relics of classic art, the most famous is the *Torso of Hercules*, a masterpiece of manly beauty discovered in the Campo del Fiore at the beginning of the 16th c., and placed, by order of Pope Julius II., in the Vatican.

TORSTENSOHN, LEONARD, Count of Ortala, the most active, enterprising, and successful of the Swedish generals who were engaged in the Thirty Years' War (q. v.), was born at Torstena, 17th August 1603, became one of the royal pages in 1618, and attended Gustavus Adolphus in most of his earlier campaigns. When Gustavus entered Germany in 1630, T. was captain of the body-guard; and the brilliant services he rendered at Breitenfeld, the Lech, and on other occasions, were rewarded with rapid promotion. Taken prisoner at the combat of Nuremberg (24th August 1632), he was subjected to rigorous treatment, which so ruined his health, that on his exchange six months after, he returned to his post in the Swedish army a confirmed invalid; yet a vigorous mind and energetic character so overmastered bodily infirmity, that though reduced to the necessity of being always conveyed in a litter, he proved himself a most able officer under Bernhard of Weimar and Baner, the successors of Gustavus. In 1641, on the death of his former chief, the able and chivalrous Baner, he was appointed to the command in chief of the Swedes in Germany. His military career was marked by a brilliancy of conception, fertility of resource, resolute daring, and above all, by an extraordinary rapidity of execution, which broadly distinguished it from those of his contemporaries, and set at naught all the precautionary and defensive measures of his opponents. Having recruited and equipped his army, he invaded Silesia, routed the Austrians at Glogau and Schweidnitz, reduced most of Moravia, and being pressed back into Saxony by the Archduke Leopold and Piccolomini, gallantly turned upon the multitude of his pursuers (2d November 1642), and on the field of Breitenfeld, where Tilly's reputation for invincibility was cast down in the dust by Gustavus, inflicted a bloody defeat on the same adversaries; he then resumed the execution of his plans of invasion, and laid Moravia and Austria under contribution. Ferdinand III., despairing of protecting his territories from T., negotiated with Christian IV. of Denmark to make a diversion by invading Sweden; but T., with characteristic promptitude, left Moravia in September 1643, traversed Saxony and the Upper Palatinate, burst into Holstein, and in less than six weeks subjugated the Danish mainland. The Austrians under Gallas followed in pursuit of him, to aid their allies, but arrived too late; and in attempting to coop him up in Holstein, were routed, and driven into Saxony; and again totally defeated (23d November 1644) at Jüterbogk, in attempting to bar his return into Bohemia. Gallas was now deposed; but a combination of talented generals, as Montecuculi, Goertz, and others, was found to be equally ineffective against the resistless Swede, who, by a great victory at Yankovitz (16th March 1645), secured the navigation of the Danube, and the possession of the hereditary countries north of it. The emperor, empress, and principal nobility now deserted the capital; the Saxons again joined the Swedes; and the Danes, routed at sea as well as on land, besought peace, which was granted (13th August 1645). At this time, when a few more of T.'s weighty blows would have completely unseated the Hapsburg family, his gradually increasing ailments compelled him to resign the command to one very much his inferior, and retire to Sweden, where he experienced a most distinguished reception from Queen Christina, was created a count, and appointed to various high

offices successively. He died at Stockholm, 7th April 1651.

TORT (Lat. *tortus*), in the law of England, includes all those wrongs for which a remedy by compensation or damages is given in a court of law, and which wrongs arise irrespective of any contract. Such are assaults, imprisonments, taking one's goods without title, injury to one's body or character. The general rule of law was, that the right of action for a tort died with the person who committed it; but this defect has been cured by statute to a certain extent. If the wrong was done within six months preceding the wrongdoer's death, an action may be brought against his executors within six months after they have assumed office. So if the injured party lived, he could always bring an action of damages; but if he died, his executors or relatives could not do so, until Lord Campbell's Act enabled the wife, husband, parent, or child of such deceased injured party to sue for damages; and in such case the jury may apportion the damages between the widow and children who sue. The right to bring an action for a tort is limited to two, four, or six years respectively, according to the nature of the wrong.—In Scotland, there is no time limited for bringing the action.

TORTEAU. See ROUNDLE.

TO'RTOISE (*Testudo*), a genus of Chelonian reptiles, which once included the whole order, but is now much restricted. The popular name T. is never given to the marine Chelonians, which are called Turtles (q. v.), and although it is sometimes given—generally with a prefix, as Marsh T., River T., Fresh-water T.—to the kinds which inhabit fresh water (see EMYS and TERRAPIN), yet when used by itself, it is commonly the designation of what are distinctively called Land Tortoises, which belong to the genus *Testudo* as now restricted, and the genera most nearly allied to it. In *Testudo*, the carapace is of a single piece, bulged, and soldered by the greater portion of its lateral edges to the *plastron* (see CHELONIA); the legs are very short; the toes are very short, and united to the

Land and Water Tortoises:
1, Common Land Tortoise (*Testuda Græca*); 2, Lettered Tortoise (*Emys scripta*).

nails, which are thick and conical, five on the fore-feet, and four on the hind-feet. The species are numerous and widely distributed, inhabitants of the warmer temperate and of tropical countries. They all feed on vegetable food. None of them are found in Britain, but several in the countries around the Mediterranean. The most common of these is the GREEK T. (*T. Græca*), which attains a length of 12 inches, and has a broad and equally bulged carapace; the scales of which are granulated in the centre, striated on the margins, and spotted or marbled with black and yellow. This is the species of an individual of which a most interesting account is given by White in his *Natural History of Selborne*. It lives to a very great age, 100 years or more, as probably do all the other species, and spends the winter in a dormant state, as do all those which are not inhabitants of tropical climates; selecting for itself a place of hybernation when cold weather begins to come on, or preparing it by scooping a hole in the earth. During the heat of summer, it feeds voraciously; but in colder weather, both before and after its hybernation, it eats little. The love-season, which is in the beginning of summer, is one of great activity, and tortoises express their amorous desires by striking their shells against those of their mates. The Greek T. is used for food in some parts of the south of Europe. The flesh of all species of T. appears to be good for food, and the eggs of all are regarded as delicacies. A very large species is the Indian T. (*T. Indica*), if several species are not confounded under that name. It has been found on the coast of Coromandel, four feet and a half in length, its bulge being about fourteen inches. It is particularly abundant in the Galapago Islands, and has even been supposed by Darwin to be originally a native of them, and to have been diffused from them by the bucaneers over other tropical regions. It is known that the bucaneers often carried away tortoises alive from the Galapagos, but this fact does not seem probably to account for the abundance of the species in other places. The Galapago T. is often 200 lbs. in weight. Its flesh is of excellent quality, as are also its eggs. It forms tracks from the arid districts near the shore to the high districts of the islands, where there are springs, for the purpose of drinking; and these tracks, which are broad and well beaten, are traversed apparently at irregular intervals, the animal swallowing a very large quantity of water at a time, so that its bladder is greatly distended, and the water contained in the bladder is at first almost pure, and is gradually absorbed. The numbers of tortoises in some tropical and subtropical countries are very great. Professor E. Forbes speaks with admiration of the numbers of *T. Græca* and *T. marginata* straying about the plains of Lycia, and browsing on the fresh herbage in spring. Darwin describes the tortoises of the Galapagos as very numerous; and Leguat, in his account of the French Protestant expedition to the island of Rodriguez, in the beginning of last century, declares that the tortoises often came out together in such numbers to feed, that a man might have walked for a considerable distance on their backs as on a pavement.

Tortoises exhibit very little intelligence; they are, however, capable of recognising the hand that feeds them.

TORTOISE-SHELL, the large scales of the carapace, or shield, of a species of sea-turtle, the *Chelonia imbricata* and *Testudo imbricata* of several authors—*Caretta imbricata* of Dr Gray. It is found in the Indian Ocean, Amboyna, New Guinea, Seychelles, Havana, and the Red Sea. Tortoise-shell is so called because formerly the order of animals to which it belongs was little known, and all were confounded under the general name of Tortoises. A remarkable peculiarity in this species is the arrangement of the thirteen plates forming the carapace, which, instead of being joined together by their edges, so as to

make apparently one piece, are thinned off at their edges, and overlap each other like the tiles of a roof. They vary in size according to the part of the shield they occupy. The larger are sometimes from a foot to 18 inches long, by 6 inches broad; the thickness rarely exceeds the eighth of an inch. The beautiful mottled colour and semi-transparent characters of this material are well known. A remarkable quality is possessed by tortoise-shell, which very greatly increases its usefulness for the ornamental purposes to which it is generally applied—that is, its property of being easily softened by a heat equal to boiling water, and of retaining any form when cold which has been given to it when heated. Pieces can also be welded together by the pressure of hot irons properly applied. In Britain, the chief use of tortoise-shell is making combs for the hair; but it is also used for inlaying small pieces of ornamental furniture and various other fancy objects. In India, China, and Japan, its use is well understood, and some very beautiful articles are made of it, exhibiting great skill and taste. Great Britain alone consumes about 15½ tons, of the value of about £24,000.

TORTO'LA. See VIRGIN ISLANDS.

TORTO'NA (anc. *Antilia*, or *Dertona*), a town of Northern Italy, in the province of same name, and situated on the right bank of the Scrivia (a small river which flows north to join the Po), and 13 miles east of Alessandria, with which it is connected by railway. Pop. about 15,000. The principal buildings are the *Duomo* and church of San Francesco. T. has manufactures of silk, leather, hats, &c. It was a notable place in the middle ages—the old walls, and the ruins of a castle in which Frederick Barbarossa lived, being a relic of those turbulent times.

TORTO'SA (anc. *Dertosa*), an old and fortified town of Spain, province of Tarragona, picturesquely situated on a sloping eminence overlooking the Ebro, from the mouth of which it is distant about 22 miles. The streets are narrow, and the place has altogether a dull look. Some inconsiderable manufactures are carried on, and the sturgeon and lamprey fisheries afford employment to considerable numbers. Pop. upwards of 20,000.

TORTU'GAS (Sp. Turtles), a group of ten islets or keys, also called the Dry Tortugas, belonging to the United States, at the entrance of the Gulf of Mexico, 120 miles west-south-west of Cape Sable, the southern point of Florida. They are low coral islets, partly covered with mangrove bushes. There has been a light-house erected on Bush Key; and refractory soldiers, and prisoners connected with the War of Secession, have been employed in erecting a fort, called Fort Jefferson.

TORTURE. Examination by torture, otherwise called 'The Question,' has been largely used in many countries as a judicial instrument for extracting evidence from unwilling witnesses, or confessions from accused persons. In ancient Athens, slaves were always examined by torture, and their evidence seems on this account to have been deemed more valuable than that of freemen. Any one might offer his own slave, or demand that of his opponent, to be examined by torture; and it was supposed to constitute a strong presumption against any one that he refused to give up his slave for that purpose. No free Athenian could be examined by torture, but torture seems occasionally to have been used in executing criminals. Under the Roman Republic, only slaves could be tortured, and as a general rule, they could not be tortured to establish their masters' guilt. Under the Empire, torture, besides being much used in examining slaves, was occasionally inflicted even on freemen, to extract evidence of the crime of *læsa majestas.* Cicero and other enlightened Romans wholly condemned its use. Until the 13th c., torture seems to have been unknown to the canon law; about that period, the Roman treason-law began to be adapted to heresy as *crimen læsæ majestatis Divinæ.* A decree of Pope Innocent IV., in 1282, calling on civil magistrates to put persons accused of heresy to the torture, to elicit confessions against themselves and others, was probably the earliest instance of ecclesiastical sanction being adhibited to this mode of examination. At a later period, however, torture came to be largely employed by the inquisitors.

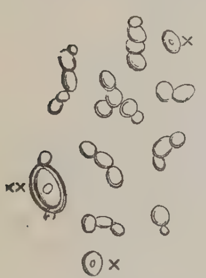
From the civil law, torture became a part of the legal system of most European countries. It was adopted early, and to a large extent, by the Italian municipalities. In Germany, elaborate apparatus for its infliction existed, not merely in the dungeons of the feudal castles, but in the vaults beneath the town-halls of Nürnberg and Ratisbon, where the various implements used are yet to be seen. It continued to be practised in the prisons of Germany when they were visited by Howard in 1770. In France, it was part of the judicial system till 1789, and in Scotland it was still in frequent use after the Restoration, and was only abolished by 7 Anne, c. 21, s. 5.

The use of torture seems always to have been repugnant to the genius of the law of England; though occasionally used by an exercise of prerogative, it may be doubted whether it was ever recognised as lawful in the ordinary course of the administration of justice. The first instance we have of its use is in 1310, in aid of the ecclesiastical law, during the struggle between Pope Clement V. and the Templars. Edward II., when applied to to sanction the infliction of torture by the inquisitors in the case of certain Templars accused of heresy and apostasy, at first refused; but on a remonstrance by Clement, he referred the matter to the Council; and on the recommendation of the Council, the inquisitors were authorised to put the accused to the torture, but without mutilation or serious injury to the person, or effusion of blood. During the Tudor period, the Council assumed the power of directing torture-warrants to the lieutenant of the Tower, and other officers, against state prisoners, and occasionally also against persons accused of other serious crimes; and similar warrants were at times issued under the sign-manual. Under James I. and Charles I., torture was less resorted to, and only in state trials. In 1628, in the case of Felton, the assassin of the Duke of Buckingham, the judges declared the examination of the accused by torture, for the purpose of discovering his accomplices, to be illegal. Torture was inflicted for the last time in England in May 1640. It is now disused in all countries of Europe, and is universally acknowledged to have been a most unsatisfactory mode of getting at the truth; often leading the innocent, from weakness of body, to plead guilty to crimes which he had not committed.

The instruments of judicial torture have been various. The most celebrated is the Rack, an oblong horizontal frame, on which the accused was stretched, while cords, attached to his legs and arms, were gradually strained by a lever or windlass, an operation which, when carried to extreme severity, dislocated the joints of the wrists and ankles. It is as old as the 2d c. in the south of Europe, but is said to have been unknown in England till introduced into the Tower by the Duke of Exeter, Constable of the Tower, whence it acquired the name of the 'Duke of Exeter's Daughter.' In Germany, the rack was sometimes furnished with a roller, armed with spikes, rounded off, over which the sufferer was

drawn backwards and forwards. A vertical rack was also in use in that country. The person subjected to it was raised to the roof by a rope attached to his arms, which were bound behind his back; and two heavy stones having been attached to his feet. the rope was loosened so as to let him fall with a jerk to within a few inches of the ground. Among the lesser tortures may be mentioned the Thumbikins, Boots, Pincers, and Manacles; and in England, an instrument called the Scavenger's (properly Skeffington's) Daughter, the invention of Sir W. Skeffington, lieutenant of the Tower in the reign of Henry VIII.

TO'RULA CEREVI'SIÆ, or the YEAST-PLANT, is one of those fungi which are connected with the process of fermentation. The general history of this fungus will be noticed in the article YEAST, and we shall here only refer to the medicinal bearing of the subject. This plant, which is also known under the names of *Saccharomyces*, *Mycoderma cerevisiæ*, and *Cryptococcus fermentum*, may be readily observed by examining a little yeast under the microscope, when it will be seen in the form of round or oval corpuscles (cells), varying in diameter from the 800th to the 400th of a line, and many having smaller corpuscles in their interior. They grow by protrusion of gemmules, and germinate sometimes on one, and sometimes on several spots of the primitive fungus cells. These shoots throwing off new gemmules, the yeast-plant gradually forms single or branching rows of oblong cells, connected together like beads. This peculiar arrangement of the cells, and the fact that they are not acted on by acetic acid, is characteristic of the plant.



The Yeast-plant, taken from a fluid ejected in large quantities from the stomach of a man suffering from stricture of the pylorus. Magnified 200 diameters.

In those cells marked ×, a young cell is seen growing in the interior; while in the large cell marked ××, there is a simultaneous internal production and external gemmation of cells.

This fungus exists in the saccharine urine of *diabetes mellitus*, after it has been discharged for 24 hours or longer, and its appearance in urine within a day or two is sufficient to lead to the suspicion of the presence of sugar. It likewise is of not unfrequent occurrence in vomited matters and in fæcal evacuations; and wherever it is found, it is indicative that the fluid is in a state of saccharine fermentation.

As fungi more or less closely resembling the yeast-plant often occur in non-saccharine urine that has stood for some days, the assumed presence of the T. C. must not be taken as a proof of the presence of sugar, although it affords a strong hint for testing for that substance.

TO'RUS, the convex member of the base of classic columns. See COLUMN.

TOTEM (a god). See SUPPLEMENT in Vol. X.

TOSHACH (Celtic, captain), the name which was given among Celtic nations to the military leader of a clan or tribe, whose functions were in early times always separated from those of the supreme judicial officer. When the office of toshach, originally elective, became hereditary, according to the principle of divided authority characteristic of Celtic communities, it remained permanently in the eldest cadet of the clan. See TANISTRY.

TOTIPA'LMÆ, Cuvier's name for a group of birds, of the order *Palmipedes*, having the hind-toe connected with the other toes by a web. Pelicans, cormorants, frigate-birds, gannets, and darters belong to this group. All the T. are marine; they feed on fishes, molluscs, and other marine animals, and are excellent swimmers and divers. Many of them have long wings, and are birds of powerful flight.

TOTNES, or TOTNESS, a municipal, and formerly a parliamentary, borough and market-town of Devonshire, situated on the slope of a steep hill, on the right bank of the river Dart, about 10 miles from its mouth. It is a place of great antiquity, has an interesting church of the 15th c., and some curious antique houses; the ruined keep of the ancient castle, on the summit of the hill, is said to have been built by Joel de Totneis, a Norman baron, on whom the manor was bestowed at the Conquest, and who founded here also a Cluniac priory. The river Dart is navigable for vessels of 200 tons up to the town, which is a place of some little shipping trade. The borough, which comprised also the suburb of Bridgetown, was disfranchised for corrupt practices by the Reform Bill of 1867. Steamers ply during the summer months between T. and Dartmouth. It is a station on the South Devon Railway. Pop. (1881) 4089.

TOU'CAN (*Ramphastos*), a Linnæan genus of birds, now forming the family *Ramphastidæ*, which belongs to the order *Scansores*, and contains nearly forty known species, all natives of tropical America, and remarkable for the magnitude of the bill. They are divided into two groups, the true Toucans (*Ramphastos*), and the Aracaris (q. v.) (*Pteroglossus*), of which the latter contains the greater number of species: the former has the largest bill, and the tail is shorter. There is a difference also in the prevalent colours, the aracaris generally exhibiting much

Toucan (*Ramphastos Toco*).

green and yellow, whilst the true toucans have the ground colour of the plumage usually black; the throat, breast, and rump often gaily adorned with white, yellow, and red. The colours, however, are not in general finely blended, but appear in strong contrast. The legs of toucans are short; the feet have two toes before and two behind. The form of the body is short and thick; the tail is rounded or

even, varying in length in the different species from half the length to almost the whole length of the body, and is capable of being turned up over the body in a remarkable manner, which it always is when the bird is at roost. The neck is short and thick; the enormous bill is at the base of the full width and depth of the head, and is in some species more than half the length of the body. It is arched towards the tip, irregularly toothed along the margins of the mandibles, and extremely cellular and light, yet strong in structure. The tongue is very long, narrow, and singularly feathered on each side, the processes which give it this feathered appearance probably adding much to its sensibility as an organ of taste. When a T. takes food between the points of the mandibles, the tongue is immediately applied to it, as if to test or enjoy it, and afterwards it is tossed into the throat by a sudden throwing back of the head. Toucans may almost be described as omnivorous; they eat fruits with avidity, but they also seize and devour small birds. Their powerful bill enables them to kill a small bird by a single squeeze. They make a curious clattering noise with their great mandibles, and also emit at times a harsh cry. They live chiefly in the depths of the South American forests, in small flocks. They are easily tamed, and bear cold climates well. In captivity, they readily eat rice, bread, potatoes, eggs, and many other kinds of food. They are remarkable amongst birds for regurgitation of food, in order to a kind of mastication in the great bill, analogous to rumination in quadrupeds. The colours of the bill are, in most of the species, very brilliant during life, but disappear from stuffed specimens in museums. The largest species, as *Ramphastos Toco*, are about 27 inches in length, the bill in this species measuring $7\frac{1}{2}$ inches, and the tail 10 inches.

TOUCH is the sense through which we take cognizance of the palpable properties of bodies. It is used in two senses. In its extended acceptation, it implies, says Dr Carpenter, 'our consciousness of *all* those sensory impressions which are neither olfactive, visual, auditory, nor gustative; and it is therefore designated as the *general sense*, in contradistinction to those which are considered as *special senses*. In its limited application, on the other hand, it is used to designate that modification of the general sensibility which is restricted to the tegumentary surface, or to some special portion of it, and which serves to excite definite ideas in our minds respecting the form, size, number, configuration, weight, temperature, hardness, softness, &c. of objects brought within its cognizance.'—Article 'Touch,' in *Cyclopædia of Anatomy and Physiology*, vol. iv. p. 1163. In the article SENSIBILITY, we have briefly noticed touch in its general sense; and we shall here confine ourselves to the investigation of the sense of touch in its limited application, as exercised by the organs specially adapted for the reception of tactile impressions.

The special organs of touch are the papillæ, which are figured and very briefly noticed in the article SKIN. These papillæ are more elevated and numerous on the palmar surface of the ends of the fingers than on any other part of the skin (although they are still larger on the tongue). They have an average length in man of $\frac{1}{100}$th of an inch. Their surface, after the removal of the epidermis, appears, from the investigations of Todd and Bowman, to be composed of the basement membrane of the cutis itself; and their interior is composed of fibrous tissue, vessels, and nerves, as is seen in the figures of the lingual papillæ given in the article TASTE, SENSE OF. In each papilla is a small arterial twig, which, entering at the base, subdivides into capillary essels, which form loops, whose convexity lies in the papillary summit. The vascularity of the papillæ is so great, that their presence and relative size may be determined simply by the depth of the colour imparted to the skin by a good injection of its vessels. Hence, as a general rule, the vascularity of the integument is proportioned to its perfection as an organ of touch. With regard to the mode in which the nerves terminate, there is still considerable doubt. According to Todd and Bowman, it is often impossible to detect any nerves at all within the papillæ, when such were plainly visible at their base; and they incline to the belief, that the nervous tubules either entirely, or in a great measure, lose the white substance when within the papillæ.

In the lower animals, as in man, the papillæ are especially developed in those parts of the outer surface which are especially endowed with tactile sensibility. For the following illustrations of this statement, drawn from comparative anatomy, we are indebted to Dr Carpenter: 'In the quadrumana generally, both the hands and feet are thickly set with papillæ; and in those which have a prehensile tail, the surface of this organ possesses them in abundance. In the carnivorous and herbivorous mammalia, whose extremities are furnished with claws, or encased in hoofs, we find the lips and the parts surrounding the nostrils to be the chief seat of tactile sensibility, and to be copiously furnished with papillæ; this is especially the case with those which have the lips or nostrils prolonged into a snout or proboscis—as in the pig, the rhinoceros, the tapir, and the elephant. In the mole, too, the papillary structure is remarkably developed at the extremity of the snout. The only part of the skin of birds on which tactile papillæ have been discovered is on the under surface of the toes, and on the web of the palmipedes, where they obviously receive impressions which guide the prehensile and other movements of the feet. In many lizards, a papillary structure is found on the under surface of the toes; and in the chameleon, it exists also on the integument of its prehensile tail. . . . . In serpents and chelonians (tortoises), no papillary apparatus has as yet been detected; and in fishes and invertebrata, its presence has not been ascertained, although it would appear that certain parts, especially the tentacles around the mouth, are endowed with a high degree of tactile sensibility.' —*Op. cit.*, p. 1166. It is probable that in all animals which have a soft fleshy tongue furnished with papillæ, this organ is an instrument of tactile sensibility as well as the organ of taste. Besides the papillary apparatus, certain animals have special organs of touch, constructed on a totally different plan, and 'consisting of a rod or filament, which is in itself insensible, but which is connected at its base with nervous fibres in such a manner that any motion or vibration communicated to it must be transmitted to them.' The so-called 'whiskers' of the cats and certain rodents, as the hare and rabbit, belong to this class; and it has been proved, experimentally, that if they be cut off, the animal loses, to a great extent, its power of guiding its movements in the dark.

Amongst the conditions necessary for the exercise of the sense of touch are (1) a normal condition of the papillary apparatus and of the nerves supplying it; (2) a due supply of blood to the tactile organs; and (3), as has been noticed in the article TASTE, a temperature not too far removed from the natural heat of the body. It has been shewn by Professor Weber, that if the fingers or the lips be immersed for half a minute or a minute in water heated to 125°, or cooled to 32°, the power of distinguishing between a hot or cold fluid or solid body is for the time completely lost, a feeling of pain alone being experienced. The result was the same on applying

cold to the trunk of a nerve, the ulnar nerve at the elbow, where it lies just beneath the skin, being selected for the experiment. The fingers supplied by this nerve soon lost the power of distinguishing between heat and cold, and could only imperfectly perceive the contact and pressure of bodies.

The above-named physiologist has made a large number of experiments on the general subject of Touch. His investigations regarding the tactile discrimination in different parts of the skin have been noticed in the article SENSIBILITY. Professor Valentin, whose results, on the whole, correspond very closely with those of Weber, found, however, a considerable extent of individual variation, some persons being able to distinguish the separate compass-points at half or even one-third of the distances required by others.

There is no sense which is so capable of improvement as that of touch. Of this power of improving the delicacy of touch, says Dr Carpenter, 'we have examples in the case of certain artisans, whose employments require them to cultivate their tactile discrimination; thus, the female silk-throwsters of Bengal are said to be able to distinguish by the touch alone *twenty* different degrees of fineness in the unwound cocoons, which are sorted accordingly; and the Indian muslin-weaver contrives by the delicacy of his touch to make the finest cambric in a loom of such simple construction that European fingers could at best propose to make a piece of canvas at it.' The highest degree of tactile sensibility is met with in blind persons—a circumstance which is to be attributed for the most part to the concentration of the attention and of the powers of recollection and comparison which are brought to bear upon the mind; and probably to some extent to an increased development of the tactile organs themselves, resulting, as the above-named physiologist suggests, 'from that augmented nutrition which would be the natural consequence of the frequent use of them, and of the increased flow of blood that seems to take place towards any part on which the attention is constantly fixed.'—For much interesting information on this subject, the reader is referred to Dr Kitto's *Lost Senses*, in which cases, apparently quite authentic, are given of blind persons being able to distinguish colours by the touch.

TOUCH-HOLE, or **VENT**. See GUN.

TOUCH-PAPER. See NITRE.

TOUCH-STONE, a hard black stone, occasionally used in assaying. The best kind is a peculiar bituminous quartz obtained from Lydia, in Asia Minor; but black basalt may be employed. The process is as follows: A series of 'needles' or small bars are formed, the first consisting of pure gold; the second, of 23 of gold and 1 of copper; the third, of 22 of gold and 2 of copper, and so on. The assayer selects one of these alloys, or 'needles,' which, from its colour, he judges to approach nearest in composition to the alloy which he is about to assay. This he rubs on the stone, and the streak which it leaves is red in proportion to the copper that is present. The streak formed by the alloy to be assayed is then compared with that formed by the various 'needles,' and corresponding streaks indicate corresponding amounts of copper. Hence, an approximate estimate of the amount of copper in an alloy can be made.—See Miller's *Inorganic Chemistry*, 2d ed., p. 739, *note*.

TOUCH-WOOD is the wood of willows and some other trees softened by decay. It is used as tinder for obtaining fire, from the readiness with which a spark ignites it.

TOUL, a fortified town of Lorraine, dep. of Meurthe, on the Moselle, and a station on the Paris and Strasburg Railway, 12 miles west of Nancy. It has an old cathedral, which took more than five centuries to finish (965—1496), and which was reckoned one of the most splendid in France. Cotton, woollen, lace, and fayence manufactures are carried on. Pop. 7687.

TOU'LA, or **TULA**, one of the governments of Great Russia, bounded on the N. by the government of Moscow. Area, 11,772 sq. m.; pop. 1,152,470. The surface is for the most part level; the climate is temperate; the soil, fertile. The Oka is the only river which is navigable throughout the government, and the other streams are tributaries either of the Oka or the Don. The surface is in general dry, there being no lakes or marsh-lands, and forests are rare. The inhabitants are occupied chiefly in agriculture, cattle-breeding, the manufacture of pottery, fishing, and the working of iron mines.

TOULA, or **TULA**, an important manufacturing town of Great Russia, capital of the government of the same name, on the Upa, an affluent of the Oka, 110 miles south of Moscow. Its 28 churches, its arsenal, theatre, industrial museum, cathedral, and the ancient Kreml are the principal buildings. T. is an ancient town, and has suffered severely from Tartar invasion, and during the wars of the commencement of the 17th century. Iron-works founded here under Czar Alexis Michailovitch have acquired a well-merited reputation. The Russian army is largely supplied with muskets and small-arms from the works of this town. Cutlery, locks, tea-urns, and bells are made in great perfection; and bristles are prepared in large quantities both for home consumption and export. Pop. 56,496.

TOULON, a great seaport and naval arsenal of France, in the dep. of Var, stands on the shore of the Mediterranean, 37 miles south-east of Marseille, with which it is connected by railway. It stands at the head of a deeply penetrating inlet or gulf, rises in the form of an amphitheatre towards the north, where its ramparts extend to the foot of a chain of lofty elevations, in part clothed with beautiful forests. The port is divided into two parts, the old and the new; the former, on the east, appropriated to merchant-vessels, and bordered by a quay; the latter, on the west, surrounded by the dockyard, slips, arsenal, storehouses, cannon-foundry, &c. Numerous forts defend the town on the land-side; and the mouth of the harbour, and the hills commanding it, are studded with forts and redoubts; while moles, hollow and bomb-proof, and formed externally into batteries, level with the water's edge, separate the roadstead from the old and new ports. Belonging to the arsenal, which is perhaps the finest in France, the chief objects of attraction are the sail-yard, the armoury, the museum, the magazine, and the basin for the repair of ships. The fortifications of the town have been greatly extended since the conquest of Algeria, T. having become the chief port of communication with Africa. The population has also greatly increased, and two new suburbs have been constructed. The town is surrounded by a double rampart, and by a wide and deep fosse. The streets are straight and wide; and, on the whole, the town is both agreeable and healthy. This town is the Plymouth of France; and its industry consists, for the most part, of those manufactures to which its position as a great naval arsenal gives rise. Pop. (1866) 77,126; (1881) 70,103.

T. was destroyed by the Saracens in 889, and again by the Saracens about the close of the 12th

century. It is only at the end of the 16th c. that T. comes to be important as a naval and military stronghold. It was taken by the English and Spaniards in 1793; but the allies were obliged to evacuate the town in December of the same year, after being fiercely attacked by the Republicans, whose guns were commanded by Napoleon—then a simple officer of artillery—who here evinced for the first time his genius and self-reliance.

TOULOUSE (anc. *Tolosa*), an important city in the south of France, capital of the dep. of the Haute-Garonne, is situated in a broad and pleasant plain, on the right bank of the river Garonne, 160 miles by railway south-east of Bordeaux. Pop. 126,936. The *Canal du Midi* sweeps round its eastern and northern sides. The Garonne is here crossed by a beautiful bridge upwards of 810 feet in length, and 72 broad, which connects T. with the suburb of St Cyprien. The city, with the exception of the southern faubourg, is not particularly handsome (though the broad quays have rather an imposing appearance), and there are few fine public buildings. One may note, however, the cathedral, containing the tombs of the counts of Toulouse; the *Capitole*, or town-hall; the church of St Sernin (1090 A.D.); the Musée, with its interesting collection of antiquities, forming an almost uninterrupted chain in the history of art, from the Gallo-Roman to the Renaissance period. T. is the seat of an archbishop, has a university academy, an academy of 'floral games' (*Société des Jeux Floraux*), pretending to derive its origin from the contests of the ancient troubadours, academies of arts, sciences, antiquities, &c., schools of law, and medicine, and artillery, a national college, an observatory, a museum, botanic garden, and a public library of 50,000 volumes. T. manufactures woollens, silks, leather, cannon, steam-engines, tobacco, brandy, &c., and carries on a great trade with Spain. Its duck-liver and truffle pies are celebrated throughout the south of France.

History.—Tolosa was, in Cæsar's time, a city within the limits of the Roman *Provincia*, and had been originally the capital of the Volcæ Tectosages, a Gallic tribe noted for its wealth and consequence. Under the empire its importance continued. Ausonius describes it as surrounded by a brick wall of great circuit, and so populous that it had founded four colonies. In 412 A. D., the Visigoths made it the capital of their kingdom; and after the time of Charlemagne, it was under the sway of counts, who made themselves independent about 920, but in 1271 the 'county of T.' was reunited to the crown of France by Philippe *le Hardi*. Its literary celebrity reaches as far back as the Roman Empire. Ausonius speaks of the *toga docta* of 'Palladian' Tolosa, and the favourite deities of the city were Jupiter, Minerva, and Apollo. At a little village close by, which still bears the name of *Viel Toulouse*, a multitude of cinerary urns, statuettes, Phœnician, Celtiberian, Gallic, Greek, and Roman medals, fragments of buildings, and an entire paved street have been discovered. Early in the middle ages, under the Counts of T. it became a seat of Provençal poetry, and was the centre of the papal crusade against the Albigenses, conducted by Simon de Montfort. The Parliament of T. had also a great reputation, but unhappily it is likely to be best remembered by one of its most iniquitous decisions, that delivered in the case of the Calas (q. v.) family.

TOURAINE, one of the former provinces of France, of which the capital was Tours (q. v.), and which was bounded on the N. by the province of Orleannais, on the E. by Berri, on the S. by Poitou, and on the W. by Anjou. It was about 60 miles in length, and nearly the same number of miles in breadth, and it appears on the map now as the department of Indre-et-Loire.

TOURCOING, a frontier town of France, dep. of Nord, $7\frac{1}{2}$ miles north-east of Lille, is built on an eminence in the midst of a fertile territory. It has a great reputation for its manufacture of linen-cloths, and also carries on sugar-refining, distilling, and manufactures of soap, colours, &c. Pop. about 40,000.

TOU'RMALINE, a mineral ranked amongst Gems (q. v.), and occurring in primitive rocks in many parts of the world. Its chemical composition is very complex and somewhat various, but the chief constituents are always silica and alumina in about equal proportions, and forming about three-fourths of the whole; the remainder consisting of boracic acid, fluorine, phosphoric acid, peroxide of iron, peroxide of manganese, protoxide of iron, magnesia, lime, soda, potash, and lithia, which are not, however, all present in any specimen. T. is harder than quartz, but not so hard as topaz or emerald. Its specific gravity is a little more than 3. It occurs in crystals, or massive and disseminated, although always crystalline. Its lustre is vitreous. Some varieties are transparent, some translucent, some opaque. Some are colourless, some green, brown, red, blue, and black. Red T. is known as *Rubellite;* Blue T., as *Indicollite;* and Black T., as *Schorl*. This last is the most common kind. T. crystallises in prisms, with 3, 4, or 9 sides, variously acuminated. The sides of the prisms are striated. The finest tourmalines are much valued by jewellers, but are comparatively rare. They mostly come from Ceylon, Siberia, and Brazil. Magnificent red and green tourmalines are found at Paris and Hebron, Maine, and other varieties in the U. S. and Canada.

TOU'RNAMENT (Fr. *tournoi*, from *tournoyer*, to turn round), a military sport of the middle ages, in which combatants engaged one another with the object of exhibiting their courage, prowess, and skill in the use of arms. The invention of the tournament has been ascribed to Geoffroy de Prenilly, ancestor of the Counts of Anjou, who lived in the 10th c.: France was its earliest *locale*, whence it spread first to Germany and England, and afterwards to the south of Europe. A tournament was usually held on the invitation of some prince, who sent a king-of-arms or herald through his own dominions and to foreign courts signifying his intention of holding a tournament and a clashing of swords in presence of ladies and damsels. The intending combatants hung up their armorial shields on the trees, tents, and pavilions round the arena for inspection, to shew that they were worthy candidates for the honour of contending in the lists in respect of noble birth, military prowess, and unspotted character. The combat took place on horseback, or at least was always begun on horseback, though the combatants who had been dismounted frequently continued it on foot. The usual arms were blunted lances or swords; but the ordinary arms of warfare, called arms *à l'outrance*, were sometimes used by cavaliers who were ambitious of special distinction. Tournaments were the subject of minute regulations, which in some degree diminished their danger. The prize was bestowed by the lady of the tournament on the knight to whom it had been adjudged, he reverently approaching her, and saluting her and her two attendants. The period when tournaments were most in vogue comprised the 12th, 13th, and 14th centuries; and the place where the most celebrated English tournaments were held was the tiltyard

near St James's, Smithfield, London. The church at first discountenanced tournaments, some of its decrees prohibiting persons from engaging in them under pain of excommunication, and denying Christian burial to a combatant who lost his life in one. The church seems, however, to have looked with more favour on these combats after the middle of the 13th century. During the 15th and 16th centuries, tournaments continued to be held, but the alteration in the social life and warfare of Europe had changed their character, and they are rather to be regarded as state pageants than as real combats. The death of Henry II. of France, in 1559, consequent on the loss of his eye at a tournament, led to their general abandonment, both in France and elsewhere, and there have been few attempts to revive them even as mere spectacles. A magnificent entertainment, consisting of a representation of the old tournament, was given at Eglinton Castle in 1839, under the auspices of the late Earl of Eglinton: Lady Seymour was the Queen of Beauty, and many of the visitors enacted the part of ancient knights.

According to Ducange, the difference between a tournament and a JOUST is, that the latter is a single combat, while in the former a troop of combatants encounter each other on either side. But this distinction has not been always observed.

TOURNAY (Flemish, *Doornik*), a fortified town of Belgium, province of Hainault, on both sides of the Scheldt, near the French frontier. It has a splendid cathedral with five towers (and pictures by Jordaens, Rubens, Gallait, &c.), several fine churches, particularly St Quentin and St Jacques, a gallery of art, an episcopal seminary, five hospitals, and a lunatic asylum. Although one of the oldest towns in Belgium, it has quite a modern appearance, with fine suburbs and beautiful broad streets. The chief manufactures are hosiery, linen, carpets, and porcelain; but there are few large workshops, most of the fabrics being executed by the people in their own houses. Pop. about 35,000. A little to the south-east lies the famous village of Fontenoy (q. v.).

T., the ancient *Tornacum* or *Turris Nerviorum* ('Fort of the Nervii'), was in the 5th and beginning of the 6th centuries the seat of the Merovingian kings, subsequently belonged to France, but at the Peace of Madrid was included in the Spanish Netherlands. Subsequently, it was oftener than once taken by France, but again restored by treaty. During the month of May 1794, it was the scene of several hotly-contested fights between the French and Austro-English armies, the most important of which was that of the 19th May, in which Pichegru beat the Duke of York.

TOURNEFORT, JOSEPH PITTON DE, one of the greatest botanists of the 17th c., born at Aix, in Provence, in 1656. He exhibited an ardent love of botany from his youth, and devoted his whole life to this science. After having explored the flora of his native district, he was sent, at the king's expense, to Spain, Portugal, England, and Holland, and afterwards to the East. He visited the Grecian Archipelago and Thrace, the shores of the Black Sea, and Asia Minor, and added a great number of species to the list of known plants. He lost his life in 1708, in consequence of a carriage running against him in Paris. He published several botanical works, and a *Voyage to the Levant.* His botanical system, which maintained its ground till the time of Linnæus, was of great use in promoting the progress of botany; but he rendered still greater service to his favourite science by grouping plants in genera. He was the first to do so. Previous botanists had merely described them individually, as species.

TOURNIQUET, an instrument for compressing the main artery of the thigh or arm, either for the purpose of preventing too great a loss of blood in amputation, or to check dangerous hæmorrhage from accidental wounds, or to stop the circulation through an aneurism.

The common tourniquet consists of three parts—viz., (1) a pad to compress the artery; (2) a strong band which is buckled round the limb; and (3) a bridge-like contrivance over which the band passes, with a screw whose action raises the bridge and consequently tightens the band. The best kind of

Common Tourniquet.

pad is a small firm roller about an inch thick; it must be placed lengthways over the main artery so as to compress it against the bone, and must be secured in its place by a turn of bandage, over which the band of the tourniquet must be applied. This band must first be tightly buckled, and the pressure must be then increased to the necessary extent (namely, till the beating of the artery beyond the instrument ceases to be perceptible) by the action of the screw, which should always be opposite the buckle of the band. As the instrument arrests the venous blood, it should never be applied tightly in cases of amputation, until the surgeon is ready to make his incision, as otherwise there would be an excessive loss of venous blood.

The credit of the invention of this most useful instrument is usually ascribed to the French surgeon Morel, who, in 1674, used a stick passed beneath a fillet, and turned round so as to twist it up to the requisite degree of tightness, as a means of preventing the undue loss of arterial blood in amputations of the limbs—a rough, but by no means ineffectual form of tourniquet, which may often be usefully extemporised in cases of emergency at the present time. Mr Young of Plymouth, in 1679, described a similar apparatus. A much improved screw tourniquet was invented by Petit early in the following century.

TOUROUKCHA'NSK, a small town of East Siberia, in the government of Yeneseisk, stands on the Yenesei, 4122 miles east of St Petersburg, and only 50 miles south of the arctic circle. Pop. 8556, who trade in furs.

TOURS, a city of France, capital of the dep. of Indre-et-Loire, and formerly capital of Touraine.

stands in the midst of a fertile but flat valley, 146 miles by railway south-west of Paris. Along its north side runs the Loire, and along its south side the Cher—these two rivers uniting about 25 miles south-west of the city, between which and their point of confluence only a very narrow strip of land separates them. The bridge over the Loire, which continues the great highway from Paris south to Bordeaux, is upwards of 1400 feet long, and south from it runs the chief street of the city, the Rue Impériale, a fine avenue, at the entrance to which are the town-hall and the museum. The cathedral is a stately Gothic edifice. Surrounding the choir—begun in 1170—there is beautiful old painted glass. The Tour de St Martin or d'Horloge, and the Tour de Charlemagne, are noteworthy as being the only remains of the cathedral founded by St Martin in the 4th century. The church was pillaged by the Huguenots, and utterly destroyed, with the exception of the two towers mentioned, at the Revolution. At a short distance west of T. are the remains of Plessis les Tours, in which Louis XI. established his residence, and in which he died in 1483. Manufactures of silk stuffs, carpets, painted glass, and pottery are carried on. Pop. about 55,000.

T., the ancient *Cæsarodunum*, dates from the time of the Gauls, and was visited by Cæsar and by Adrian. Here Clovis, having come to thank St Martin for the victory of Vouillé, received the crown of gold and the purple robe presented to him by the Emperor Anastasius. Henry IV. planted the first mulberry-trees known in France here, and here the first silk-factories were established. Under Richelieu, 40,000 hands were employed at T. in this branch of manufacture; but the industry of the town was ruined by the revocation of the Edict of Nantes.

TOURVILLE, Anne Hilarion de Cotentin, Count de, third son of César de Cotentin, seigneur de Tourville, was born at Tourville in 1642. Entering the French navy when about eighteen, it seems that his somewhat delicate and effeminate appearance caused him to be regarded as anything but a hopeful seaman. He became, however, almost immediately conspicuous for bravery and enterprise; and the first six years of his naval service, directed against the Turks and Algerians, established his reputation both in France and in the south of Europe. In 1667, he was received at Versailles with great distinction by Louis XIV. In 1669, he distinguished himself in the expedition sent by France to the relief of Candia, then besieged by the Turks; and again in 1671—1672, in the naval war waged by the combined fleets of France and England against the Dutch. In 1682, he was made lieutenant-general of the navy, and for the following two or three years he was engaged in suppressing the pirates of Algiers and Tripoli. In the war which broke out after the English revolution of 1688, between France on the one part, and England and Holland on the other, T. was put at the head of the French navy. In June 1690, he entered the English Channel at the head of a powerful fleet, and inflicted a disastrous and ignominious defeat on the united English and Dutch armament near Beachy Head. 'There has scarcely ever been so sad a day in London,' says Macaulay, 'as that on which the news of the battle of Beachy Head arrived.' T. ranged the Channel unopposed; and on 22d July his fleet cast anchor in Torbay (see Macaulay, *History of England*, vol. iii. p. 652—654, ed. 1855). In 1692, Louis XIV. having resolved to invade England on behalf of James II., an immense fleet was assembled at Brest under T. in order to protect the descent. On the 16th May of this year the French fleet was descried from the cliffs of Portland, and on the following morning the English and Dutch force stood out to give battle. From the morning of the 19th to the afternoon of the 24th, raged one of the greatest naval battles of modern times, that of Cape La Hogue. It ended in the complete defeat of the French, 16 of their men-of-war being utterly destroyed. In spite of this disaster T. was graciously received at Versailles: 'We have been beaten,' said Louis to him, 'but your honour and that of the nation are unsullied' (see *Memoirs of St Simon*). On 27th March 1693, T. was made a Marshal of France. Sailing from Brest harbour in the spring of this year, he attacked an English merchant fleet under inadequate convoy, and succeeded in inflicting a damage on English traders estimated at some millions sterling. Sir George Rooke, who commanded the convoy, had some difficulty in saving his own squadron from destruction. This was the last exploit of the great French admiral; his career ending with the peace of Ryswick in 1697. He died at Paris, 28th May 1701. It has been said of T. that he was competent to fill any place on board ship, from that of carpenter to that of admiral. It has also been said of him, that to the dauntless courage of a sailor he united the suavity and urbanity of an accomplished gentleman. But though a brave man, he was, during the earlier part of his career, a timid commander. Reckless of his life, he was often pusillanimously cautious where his professional reputation was at stake. Latterly, stung by the censures drawn on him by his natural disposition, he became bold even to rashness.

TOUS-LES-MOIS, a starch made in the West Indies, from the roots of a species of canna (see Indian Shot); it is used as a substitute for arrowroot.

TOUSSAINT, Anna Louisa Gertrude, one of the most popular living Dutch novelists, was born at Alkmaar, September 16, 1812, where her father, a highly esteemed lecturer on chemistry, died in 1859. After the revocation of the Edict of Nantes, her paternal ancestors fled from France, and took refuge, first at Hanau, and later in Friesland, where they ranked among the nobility, but were reduced in circumstances during the French usurpation. By the mother's side, she is also of a refugee family of the name of Rocquette, belonging to the higher class of merchants and manufacturers. Her first work, *Almagro*, published in 1837, was well received, and translated into German. Speedily followed *De Graaf van Devonshire*, an episode in the early life of Elizabeth Tudor; then *De Engelschen te Rome*, a historical novel of the times of Pope Sixtus V.; in 1840, the *Huis Lauernessé*, a story of the Reformation, which has gone through several editions, and been translated into German and English. Her popularity was increased by a series of novels in 10 volumes, 1845—1855, under the titles of *De Graaf van Leycester in Nederland* (The Earl of Leicester in the Netherlands), *De Vrouwen van het Leycestersche tijdperk* (The Women of the Times of Leicester) and *Gideon Florentz.* Her other works are numerous including *Cardinal Ximenes*, *The Duke of Alba in Spain*, *The Princes Orsini*, *De Mauléon*, *Dom Abbondio II.*, *Mother-joy and Mother-grief*, *The Orphan of Alkmaar*, *The Leyden Student in* 1593, *The Biography of the Landscape Painter Maria van Oosterwijk*, &c. Her last work appeared in 1865, in a magazine called *The Guide*, and will shortly (1866) come out in 2 vols. In 1845, the magistrates of Alkmaar gave her a handsome present, as a token of the high regard of her fellow-citizens. In 1851, she married Johannes Bosboom, a distinguished painter, and has since resided at the Hague. Besides other honours, her husband obtained the gold medal at

Brussels in 1842, and for paintings of churches, the large gold medal at the Paris Exhibition in 1855.

TOUSSAINT, FRANÇOIS DOMINIQUE, surnamed L'OUVERTURE, was born at Buda, in St Domingo, in 1743. His father and mother were both African slaves. When the French Revolution broke out, it found him in the position of coachman to a M. de Libertat, who appears also to have employed him as a sort of sub-manager of an estate for which he was himself the factor. In 1791, the French Convention passed the memorable decree, by which the rights of French citizens were given to people of colour. In the revolutionary strife which followed in St Domingo, T. was, for the next three years, conspicuous for his adherence to the cause of royalty and Catholicism; but the decree of February 4, 1794, which declared all slaves free, won him over to the side of the French republic. He joined their commander, Laveaux, by whom he was made a general of division. In 1793, in the midst of the troubles, the British had landed a force and taken partial possession of the island. Against them T. now proved himself an able and indefatigable enemy, bringing the whole of the northern division of the island under the dominion of the French republic. In 1795, in consequence of a conspiracy of three mulatto generals, Laveaux was arrested at Cape Town; but T., assembling his negroes, and uniting himself to the French force, quickly effected the release of the governor. The gratitude of Laveaux was very great; and, in 1796, the Commissioners of the Directory appointed T. chief of the army of St Domingo. Shortly after this event, General Maitland, the British commander, surrendered to him all the strong places which he had hitherto held in the island. This was followed in 1801 by the submission of the Spanish forts. The whole of St Domingo was then under the rule of Toussaint. His sway was vigorous and upright; and the agriculture and trade of the island both flourished under him. He was now at the summit of his prosperity. He assumed great state, though still retaining habits of personal simplicity. But a more powerful despot now found himself at leisure to interfere in the affairs of the island. During the peace of Amiens, Napoleon Bonaparte issued a proclamation re-establishing slavery in St Domingo. This was met by a counter-proclamation by T., issued on December 18, 1801, in which, while professing obedience, he shewed plainly that he meant resistance. A squadron of 54 sail of the line, under General Le Clerc, very soon made its appearance to enforce the edict of the first consul. It became apparent that T. had defied an enemy considerably too powerful for him. He was obliged to retire to the Morne of Chaos, where he hid his treasure. On February 17, 1802, he was proclaimed an outlaw. Finally, he agreed to surrender, and was received with military honours. He was afterwards treacherously arrested, and sent to Paris, where, after ten months of rigorous imprisonment, he died on April 27, 1803. It is difficult, from the conflicting testimony to form any correct estimate of the character of Toussaint. His temperament seems to have been romantic and imaginative, while results shew that his talent for organisation and administration must have been of a high order.—See *Histoire de l'Expédition des Français à Saint Dominique*, by Metral (Par. 1825); *Vie de Toussaint l'Ouverture*, by St Remy (Par. 1850); and *The Life of Toussaint l'Ouverture*, by Dr Beard (Lond. 1853).

TOWER OF LONDON, in feudal days, a powerful fortress; then, and long after, a state prison of gloomy memories; now, a government storehouse and armoury, and still, in some sense, a stronghold, is an irregular quadrilateral collection of buildings on rising ground adjoining the Thames, and immediately to the east of the city of London. The space occupied is between 12 and 13 acres, and the whole is surrounded by a moat of fair width, but no great depth. Usually, the moat is dry, but the garrison have the power of flooding it Seen from without, the moat is bordered within by a lofty castellated wall, broken by massive flanking-towers at frequent intervals. Within this wall rises a second of similar construction, but greater height; and within this, again, are the several barracks, armouries, &c.; and in the centre of all, the lofty keep or donjon known as the White Tower. This last, which nearly resembles Rochester Castle, and like it, was built by Gundulph, Bishop of Rochester, in the time of William the Conqueror, is the centre of interest and antiquity in the whole structure. Its walls are in parts 16 feet thick, and of solid masonry. This tower was the court of the Plantagenet kings. The various other towers are principally noteworthy on account of the illustrious prisoners who have pined in them, or left them for the scaffold. In the north-west corner of the quadrangle is St Peter's Chapel, now the garrison church. In another part is the Jewel-house, containing the crown jewels, or *Regalia*, comprising several crowns, sceptres, globes, and jewels of enormous value. Near this building is the Horse-armoury, a collection of ancient and mediæval arms and armour, the latter being exhibited in complete suits on wooden figures of men and horses. To the crown jewels and the armoury, visitors are admitted on payment of a small fee.

Early writers have alleged that Julius Cæsar first built the Tower of London as a Roman fortress; but there is no written evidence to prove the existence of any fortress on this site before the construction of the White Tower by Bishop Gundulph in 1078. Some earlier structure of the Saxon times appears to have been there, from the massive foundations which have been discovered in the course of subsequent erections; but of the nature of those buildings we know nothing. During the reigns of the first two Norman kings, the Tower seems to have been used as a fortress merely. In Henry I.'s time, it was already a state prison. That monarch and his successors gradually increased the size and strength of the ramparts and towers, until the whole became a stronghold of the first class for feudal times. The kings frequently resided there, holding their courts, and not unfrequently sustaining sieges and blockades from their rebellious subjects. Of the long list of executions for political offences, real or imputed, that of Lords Kilmarnock, Balmerino, and Lovat, after the Rebellion of 1745, was the last. Wilkes, Horne Tooke, and others have since been confined there; but happily, blood has ceased to flow since the existence of a living opposition has been found consistent with the safety of the government.

Not the least interesting memorials are the quaint and touching inscriptions cut by hapless prisoners on the walls of their dungeons.

In 1841, a very serious fire broke out in the Bowyer Tower, and extended to the armouries, causing the destruction of numerous modern buildings and many thousand stand-of-arms. At present, the Tower of London is a great military storehouse in charge of the War Department, containing arms and accoutrements for the complete equipment of a large army. The Mint and Public Records were formerly kept in it, but have now been removed to other buildings more suitable. Flamsteed, when first appointed Astronomer-royal, made his observations

from the summit of the White Tower; afterwards, he removed to Greenwich. It is needless to say that, viewed as a fortress, the Tower would be useless against modern arms.

The government is vested in a Constable, who has great privileges, and is usually a military officer of long service and distinguished mark; the Deputy-constable, also a general officer of repute, is the actual governor. He has a small staff under him, and the corps of Yeomen of the Guard, more commonly known as Beefeaters. In addition, a wing, and occasionally a battalion, of infantry is quartered in the barracks.—Bayley's *History of the Tower of London*, 2 vols. 4to; *Memoirs of the Tower*, by Britton and Brayley, 1 vol. 8vo (1831); *Memorials of the Tower of London*, by Lord De Ros (1866); W. H. Dixon, *Her Majesty's Tower* (1869).

TOWN-ADJUTANT, TOWN-MAJOR, officers on the staff of a garrison. They are often veteran officers, too much worn for field-service. The pay depends on the magnitude of the trust. The town-major ranks as a captain: the adjutant as a lieutenant. The duties of these officers consist in maintaining discipline, and looking after the finding of the batteries, &c.

TOWN-CLERK is the clerk to a municipal corporation, elected by the town-council. In England, he holds his office during pleasure, and his salary is paid out of the borough funds. His duties are: to take charge of the voting-papers in the election of councillors, to keep the records of the borough and lists of burgesses, and to perform a variety of miscellaneous duties imposed by sundry acts of parliament. —In Scotland, he holds his office *ad vitam aut culpam*, is the adviser of the magistrates and council in the discharge of their judicial and administrative functions, attends their meetings, records their proceedings, is the proper custodier of the records of the burgh, and keeper of the registers of sasines and deeds within it. Various important statutory duties are also assigned to him in relation to the registration of voters, the conduct of municipal elections, the valuation of lands and heritages, the registration of births, marriages, and deaths, the licensing of public-houses, &c. In the performance of a large proportion of these duties, he is independent of the town-council, who cannot make his appointment during pleasure, or attach to it any condition which might enable the council either to control him in the conduct of the business of his office, or withdraw from him any portion of his emoluments, so far as derived from fees. Being thus protected in the independent and impartial discharge of his functions as a public officer, he is bound to give extracts from the records in his custody without reference to the town-council, and is liable *personally* for the consequences of failure in any department of his duty. He is not, however, a magistrate in any sense, and cannot be held responsible for the obligations of the burgh, or for the omissions or neglect of the magistrates and council.

TOWN-COUNCIL is the governing body in a municipal corporation, elected by the community. The town-council administers the affairs of the borough in relation to its common property and to a variety of other matters, appointing the several officers required for this purpose. It is also charged with important functions in regard to police and sanitary matters; and the tendency of recent legislation is to concentrate in the council all matters of local administration. For the more effectual government of the community under its jurisdiction, the council is empowered to make by-laws, or private statutes, so far as not inconsistent with common law or public statute, or the constitution of the borough. One-third of the council go out of office every year, but are eligible for re-election at the annual elections in November. In all the corporate or borough towns of England (unless London, and a few other places specially excepted from the Municipal Corporation Act, 5 and 6 Will. IV. c. 76), the town-council consists of the mayor, aldermen, and councillors. The councillors vary in number from 12 to 64, according to the population of the town; and one-third of the number are aldermen. Every burgess who is enrolled in the burgess-roll—i. e. every inhabitant householder (who has been for three years, in respect of property, rated to the poor) in the borough, or within seven miles of the borough—is entitled to vote in the election of councillors. The council elects the mayor, who continues in office for one year. The aldermen are elected from the councillors, or from persons qualified to be councillors. In the larger boroughs, a person is not qualified to be a councillor unless he is worth £1000, or is rated for the support of the poor to the extent of £30 and upwards; but in the smaller boroughs, he is qualified if worth £500, or rated for the poor at £15.—In Scotland, the town-council consists of the provost (in burghs which have a provost), bailies, treasurer, and common councillors, with the addition, in Aberdeen, Dundee, and Perth, of the dean of guild, and in Edinburgh and Glasgow, of the dean of guild and convener of the trades. The election of councillors in the large proportion of the royal burghs is mainly regulated by the Act 3 and 4 Will. IV. c. 76, under which every person who possesses the qualification requisite for voting in the election of the member of parliament, and who has resided for six months previous to the 30th of June in or within seven miles of the royalty, is entitled to vote in the election of councillors. The persons entitled to be registered as parliamentary electors in burghs, are those who have, for not less than twelve months previous to the last day of July, been occupiers of any buildings within the burgh of the yearly value of £10, or the owners or husbands of the owners of such premises, though not occupying the same; provided always, that they are not in arrear of assessed taxes; that they have resided in the burgh, or within seven miles of it, for six months previous to the last day of July; and that they have not received parochial relief for twelve months. Joint occupants, whose house is of the yearly value of £10, are also entitled to be registered as voters. Every elector residing or carrying on business within the royalty is eligible as a councillor; but in burghs where burgesses exist, the person elected must be a burgess before induction. The number of councillors varies in different burghs. The larger burghs are divided into wards or districts, each of which elects its proportion of councillors, as the smaller burghs do the whole council. The provost (in burghs which have a provost), bailies, treasurer, and other office-bearers fixed by the set or usage of each burgh, are elected by the councillors, the provost and treasurer holding office for three years, and the other office-bearers for the unexpired period of their councillorship. Vacancies in the magistracy or council are filled up *ad interim* by the remaining members of council—the person so elected retiring at the succeeding annual election. In burghs returning members to parliament, but not royal burghs, the election of members of council is regulated by 3 and 4 Will. IV. c. 77, and 4 and 5 Will. IV. c. 86, the provisions of which are very similar to those above explained. In those more ancient royal burghs which, on account of the smallness of the population, are exempted from the provisions of the 3 and 4 Will. IV. c. 76, the election of

magistrates and councillors is conducted according to ancient practice.

Previous to the municipal reform acts in the reign of William IV., town-councils were generally close corporations; the members elected their successors; business was conducted in private; and corrupt practices, with a variety of other abuses, prevailed. In the present day, the town-council system is marked by defects of a different kind. Proceedings are very properly conducted publicly, but unfortunately much valuable time is often spent in making speeches with a view to being reported; on the plea of scruples of conscience, opportunities are taken to obstruct measures of the most salutary nature; subjects of a purely secular kind are judged with a sectarian bias; contrary to the principles of constitutional government, minorities will not submit gracefully to the decision of majorities, but by repeated and wearying manœuvres contend for the mastery; and, intimidated by the wranglings which too frequently prevail, the higher and more intelligent order of citizens will not allow themselves to be put in nomination for office. A leading error in the organisation of these bodies is perceived to consist in the large number of members; and it seems to be a growing opinion, that unless the number is everywhere greatly diminished, and a higher tone introduced into the proceedings, town-councils will inevitably lapse into that degree of public contempt from which they were rescued by the reform acts. On the public at large rests the responsibility of endeavouring to elevate the character of these civic corporations, the condition of which is in many places a heavy scandal and reproach.

TOWNSHEND, Charles, Viscount Townshend, English statesman, born 1676, was descended from a very ancient English family, which has been settled at Raynham, in Norfolk, since the reign of Henry I. His father, Horatio, had been a prominent member of the Presbyterian party before the Restoration, and having been one of the most forward in restoring the monarchy, was, by Charles II., made Baron in 1661, and Viscount in 1682. He died in 1687, when his son was only eleven years old. When he was of age to take his seat in the Upper House, he adopted his father's politics; but soon afterwards became a disciple of Lord Somers, and cordially co-operated with the Whigs. He was named by the Godolphin administration one of the commissioners for arranging the Union with Scotland, and was rewarded for his exertions by the captaincy of the yeomen of Queen Anne's Guard. He was then employed as a diplomatist; was joint-plenipotentiary with Marlborough at Gertruydenberg; and negotiated with the States-general the Barrier Treaty, which pledged the States-general to the Hanoverian succession, and England to procure the Spanish Low Countries for the United Provinces, as a barrier against France. In 1712, upon the formation of the Harley ministry, T. was dismissed from his places, and the Barrier Treaty was censured by the House of Commons, which voted that T. and all who had been concerned in the treaty were enemies to the queen and kingdom. This persecution raised him from the rank of a follower to the station of a leader. He maintained a close correspondence with the court of Hanover, and obtained the entire confidence of George I., who, on his accession to the throne of England, made him his chief minister. While George I. was still at the Hague, on his way to his new kingdom, he made T. Secretary of State, with power to name his colleague. He selected General, afterwards Earl, Stanhope, and formed a ministry entirely Whig in its party character. He strengthened it by the addition of Walpole, who, from being at first Paymaster of the Forces, was soon made Chancellor of the Exchequer and First Lord of the Treasury. The principal act of the government was the passing of the Septennial Bill, a bold and unconstitutional act. After the breaking up of the South Sea Bubble, and the deaths of Sunderland and Stanhope (q. v.), T. (1721) again became Secretary of State. But he was no longer the acknowledged leader of the Whigs. The superior talent of Walpole, his financial abilities, and his influence in the House of Commons, caused a change in the relative position of the two ministers, and converted those who been so long friends and colleagues, and who were also connected by ties of marriage (for T. had married Walpole's sister), into rivals and enemies. An open and unseemly quarrel broke out between them. They seized each other by the collar, and then laid their hands upon their swords. The interposition of friends prevented a duel; and T., resigning the contest, retired to Raynham, to cultivate his paternal acres. Walpole, on being asked the cause of his difference with his brother-in-law, replied: 'As long as the firm was Townshend and Walpole, all did very well; but when it became Walpole and Townshend, things went wrong, and a separation ensued.' T. introduced the turnip into Norfolk from Germany, and thus effected a most beneficial revolution in agriculture. He steadily refused to re-appear in public life, and died in a good old age, in June 1738, leaving behind him a high reputation for integrity and steady consistency in sound and constitutional principles of government.

TOWNSHEND, Charles, The Right Hon., English orator and statesman, was second son of the third Viscount Townshend, and grandson of the foregoing. He was born in 1725, and entered the House of Commons in 1747, as a supporter of the Pelham (Whig) Administration. His first great speech was against the Marriage Bill in 1753, which gained him a great reputation for eloquence. Upon the dissolution of the Whig government, the Earl of Bute gained him by the offer of the post of Secretary at War. On Bute's resignation in 1763, he was appointed First Lord of Trade and the Plantations. By this time, the versatility of his political career had obtained him the appellation of 'the Weathercock.' In the Chatham ministry of 1766, he accepted the post of Chancellor of the Exchequer, and leader of the House of Commons. When Lord Chatham, in a distempered state of mind, abdicated the post of First Minister T. broke loose from all restraint, and manifested the greatest vanity, ambition, and arrogance. George Grenville, smarting under the defeat of his favourite scheme of taxing America, on one occasion, in the middle of his harangue, turned to the ministers: 'You are cowards,' he said; 'you are afraid of the Americans; you dare not tax America.' T.'s fiery temper was kindled, and he exclaimed: 'Dare not tax America! I dare tax America.' Grenville retorted: 'I wish to God I could see it!' and T. replied: 'I will, I will.' He was not allowed to forget his pledge; and finding the notion of an American revenue agreeable to the court, and not unpalatable to the House of Commons, he proposed and carried those measures that led to the separation of the American colonies. T.'s wife was created a peeress, and he was about to be intrusted with the formation of a ministry, when he was carried away by a putrid fever (September 1767) in his 42d year. The difference between his contemporary reputation and his fame is very striking. He was ranked as an orator with Pitt. He was far more popular than the great commoner with the House of Commons; yet his name will not go down to

posterity, save in the annals of his time. Burke called him 'the delight and ornament of the House of Commons.' Macaulay speaks of him as 'the most brilliant and versatile of mankind,' who had 'belonged to every party, and cared for none.' Earl Russell describes him as 'a man utterly without principle, whose brilliant talents only made more prominent his want of truth, honour, and consistency.' He married Caroline, daughter and heiress of John, second Duke of Argyll and Greenwich, and widow of the Earl of Dalkeith, and had the discrimination to select Adam Smith as the tutor and travelling-companion of his step-son, the youthful Duke of Buccleuch.

TOWNSHIP, in English Law, means a division of a parish in which there is a separate constable, and for which there may be separate overseers of the poor.

TOYS. The making of toys forms a very important industrial occupation. Large numbers are made in London, Birmingham, and other places in Great Britain; but by far the largest number are made in Germany and Switzerland. Nürnberg is especially important in this respect, a large portion of the inhabitants of that town being engaged in the manufacture and trade in toys. The value of the toys imported annually into Britain is about £140,000.

TOXICO′LOGY is the term commonly employed in Medical Jurisprudence to designate the science of poisons. It embraces the physical and chemical history of all known poisonous substances, the methods of testing for them, their action on the living body, the *post-mortem* results which they occasion, and (according to some writers) the medical treatment that should be adopted. The word has a somewhat far-fetched origin. The Greek word *toxicon* signifies 'anything relating to *toxon*, a bow;' hence, with the word *pharmacon*, a drug, it was used to designate 'poison for smearing arrows,' and finally, *poison* generally.

TRA′CERY, the beautiful forms in stone with which the arches of Gothic windows are filled or traced for the support of the glass. These forms vary with every variety of Gothic architecture. Gothic windows were at first narrow, and were covered with a simple arch. Then two windows were grouped together, and an arch thrown over both. The space thus enclosed became part of the window, and was at first pierced with a circle,

Fig. 1.

quatrefoil, or other opening (fig. 1). When three or more windows were grouped under one arch, the *shield* or space in the arch became larger, and was pierced with apertures of various forms. In the early Pointed styles, these were usually circles filled with cinquefoils, trefoils, &c. (fig. 2). During the Decorated period the tracery became more varied in form, being composed of squares, triangles, and other forms, filled with foils, and having the appearance of being packed together (fig. 3). This

Fig. 2.

kind of tracery is called 'Geometric.' The windows of the transition from Decorated to Perpendicular had tracery of a more flowing character, while that of the Perpendicular Period (q. v.) became almost entirely composed of vertical lines. The

Fig. 3.

Flamboyant (q. v.) or contemporary style in France had tracery of a very different description—being as free and graceful as the other was straight and stiff.

Panels are often filled with tracery, the exteriors of the Perpendicular period being covered with such. The woodwork of all periods is filled with ornamental tracery.

TRACHE′A, The, is sufficiently described in the article Respiration. We have here only to notice those affections of this tube which require surgical or medical aid.

Foreign bodies occasionally pass through the larynx into the trachea. In cases of this kind, the patient who has had some foreign substance in his mouth which is supposed to have been swallowed, is seized with a convulsive cough, threatening suffocation, but subsiding after a time. The symptoms that then ensue vary with the weight and figure of the substance, and according as it is fixed or movable. A large and very irregular body may be impacted in the trachea, and may thus more or less obstruct the respiration on both sides of the chest; and this obstruction will probably soon be increased by the inflammatory products that are excited. A small heavy body will usually pass through the trachea into one of the bronchi (usually the right), or into one of its branches, obstructing respiration to a less extent.

'If the foreign body be allowed to remain, the progress of the symptoms presents much variety in different cases. Death may occur from spasm of the

glottis, or, the foreign body being propelled upwards into the rima, death may take place by its mechanically preventing the passage of air, or rupture of one of the cerebral blood vessels may be produced during one of the fits of coughing. At a later period the lungs may become congested and emphysematous, or bronchitis, pneumonia, or pleurisy may supervene.'—Gray's article on 'Injuries of the Neck,' in Holmes's *System of Surgery*, vol. ii. p. 306. Although inversion of the body, together with succussion and lateral movement of the larynx, has in some few cases been successful, it is now deemed advisable by the highest authorities to precede the attempt at removal by making an artificial opening into the windpipe. A free aperture is thus secured for respiration, spasm of the glottis is prevented, and the foreign body is commonly expelled through the artificial opening, or falls through the glottis into the mouth.

Rupture of the Trachea from external injury occasionally happens, and generally proves fatal in consequence of the rapid and extensive emphysema which usually ensues. It is too rare an accident to require a more special notice.

Wounds of the Trachea are sufficiently described in the article THROAT. With the exception of Croup (q. v.), there is no special disease of the trachea; and indeed in croup the trachea is seldom exclusively affected. Hence the term *Tracheitis*, used by some nosologists as synonymous with croup, is hardly warrantable. Similarly, in more advanced life, the trachea is doubtless often the seat of inflammation, but never the special and exclusive seat, and both the symptoms and treatment merge into those of bronchitis or laryngitis.

TRACHEO'TOMY AND LARYNGO'TOMY. The air-passages may be opened in three different situations—namely, through the crico-thyroid membrane (see LARYNX), when the operation is termed Laryngotomy; through the cricoid cartilage and the upper rings of the trachea, the operation being known as Laryngo-tracheotomy; and through the trachea, below the isthmus of the thyroid gland, constituting Tracheotomy proper. Laryngotomy and tracheotomy are more commonly performed than laryngo-tracheotomy, to which no further allusion is required. Laryngotomy is more quickly and easily performed, especially in adult males, and is less dangerous; tracheotomy is a more difficult, tedious, and dangerous operation, but in some cases (as, for example, where there is any necessity for introducing the forceps) must be selected. It is unnecessary to enter into details regarding the modes of performing these operations. When the operation is completed, a large curved tube to breathe through is inserted in the aperture, and secured round the neck with a tape.

A double tube or canula possesses many advantages, as, by withdrawing the inner one, which should slightly project at its lower extremity, it may be cleared of any mucus or blood that may have accumulated in it, without disturbing the wound. The calibre of the inner tube should always be sufficiently large to admit as much air as usually passes through the chink of the healthy glottis. The after-treatment is much the same as that required for wounds in the Throat (q. v.). 'Opening of the air-passages may be required,' says Mr Gray, 'in any case of disease or injury which produces mechanical impediment to the passage of air from the mouth into the trachea; in cases of foreign substances in the air-passages; and in some cases of suspended animation where artificial inflation of the lungs cannot be performed by the ordinary means.'—Holmes's *System of Surgery*, vol. ii. p. 317. In the case of a foreign body, its situation will determine the seat of the incision. Amongst the cases in which tracheotomy is, or may be, required, are cut throat, acute laryngitis, croup, diphtheria, chronic inflammation and ulceration of the larynx, necrosis of the laryngeal cartilages; tumours, excrescences, or epithelial growth within the larynx; tumours (bronchocele, abscesses, &c.) external to the larynx or upper part of the trachea, and impeding respiration by pressure, &c. It has also been recommended, but with little advantage, in hydrophobia, tetanus, and severe forms of epilepsy, with the view of relieving the suffocating spasms that occur in these diseases. Laryngotomy may advantageously be resorted to in cases of spasm of the glottis, in inflammation with œdema of the cellular tissue of the larynx, in inflammation of the tongue, in tonsilitis and pharyngitis, if the swelling is so great as to produce symptoms of suffocation, &c.

TRACHO'MA (derived from the Greek *trachus*, rough) is the term employed in ophthalmic surgery to designate a granular condition of the mucous covering of the eyelids, often accompanied with haziness and vascularity of the cornea. It is one of the most serious *sequelæ* of purulent Ophthalmia (q. v.).

TRA'CHYTE, a volcanic rock, principally composed of Felspar (q. v.), confusedly agglomerated in crystals, which are usually very small. Crystals of mica and hornblende are often also present, and more rarely crystals of augite, all embedded in a felspathic paste. The name is from the Greek *trachys*, rough; the rock being rough to the touch. *Trachytic Porphyry* is a porphyry essentially composed of trachyte. By some geologists, T. has been made the name of a class of volcanic rocks, in which Clinkstone, Obsidian, and Pumice are included.

TRACING-PAPER. See PAPER.

TRACTA'RIANISM, a remarkable and important movement in the English Church during the second quarter of the present century, which consisted in an endeavour to revive and bring into prominence the principles of antiquity, catholicity, and authority recognised in some portions of the Anglican formularies, in contrast to the Protestant sentiments long and widely prevailing. The name is derived from a series of papers entitled *Tracts for the Times*, published at Oxford during the years 1833—1841, hence called the 'Oxford Tracts.' The causes of this remarkable reaction it would be difficult to ascertain. The agitation of the question of Roman Catholic emancipation led, in some cases, to the study of Catholic theology, with a view to determine the real grounds of difference between the Roman and Anglican churches; and the religious and æsthetic tone of Wordsworth's poetry, still more developed in Keble's *Christian Year* (published in 1828), may have disposed some minds to sentiments to which it was akin. The lectures of Bishop Lloyd, when Regius Professor of Divinity at Oxford about 1823, on the Prayer-book and the Council of Trent, are considered to have led the way to the teaching of the *Tracts*. But the immediate origin of the movement appears to have been the alarm aroused for the interests of the English Church on the occasion of the suppression by the reform government of some of the Irish sees, and threatened alienation of Irish church property. It is said that about that time a meeting of clergymen took place at Hadley, in Suffolk, at which measures were concerted for opposing the alleged latitudinarian tendencies of the day, and restoring the High Church theology of the Anglican divines of the 17th century. The chief promoters of the movement were the Rev. John Keble, author of the *Christian Year*

Fellow of Oriel, and formerly Professor of Poetry at Oxford; Rev. J. H. Newman (q. v.), and R. H. Froude, also Fellows of Oriel; the Rev. E. B. Pusey, Regius Professor of Hebrew, and Canon of Christ Church; Rev. Isaac Williams, Fellow of Trinity, author of the *Cathedral and other Poems;* Rev. Hugh Rose of Cambridge; and others. The *Tracts* were issued anonymously, and, together with articles in the *British Critic* by the same writers, produced a great effect, especially among the clergy. Protestant principles were openly discountenanced, and tenets closely resembling those of the Church of Rome were boldly put forward. The doctrines of Apostolical Succession, Priestly Absolution, Baptismal Regeneration, the Real Presence, the Authority of the Church, and the value of Tradition, which had long lain hid in the language of the Prayer-book, were widely revived and taught, and caused much alarm in some quarters; though it must be admitted that those principles had always been held by a portion of the English clergy, and claimed to be only a fair exponent of the teaching of the church. The study of the Fathers and old divines, of church history and ancient liturgies, was greatly revived in the universities and among the clergy, and a host of publications inculcating with more or less extravagance the same views issued from the press. The movement proceeded, notwithstanding the general opposition of the authorities, till it culminated in the publication, by the Rev. J. H. Newman, of the Tract No. 90, which was designed to shew that much Roman doctrine might be held consistently with subscription to the Thirty-nine Articles. This being held to favour a 'non-natural' interpretation, was received with general condemnation, and led to the termination of the series, to the resignation by Mr Newman of the vicarage of St Mary's, Oxford, and subsequently to his secession, in 1845, to the Church of Rome. In this step he was followed by many of his friends and associates, though the other leaders of the movement have continued in the English Church. With Mr Newman's secession, the Tractarian movement terminated; but its effect remains in several visible results. 1. The first of these may be said to be the revival and strengthening of the High Church party, which still maintains to a great extent the principles advocated in the *Tracts;* and though checked by some judicial decisions, such as the Gorham (q. v.) judgment, in the endeavour to acquire exclusive power, has gained great and perhaps increasing influence in the church. 2. Side by side with the revival of Catholic doctrines, there has been a great development of ritual. The Tractarian movement was early marked by the introduction of various alterations in the mode of performing divine service, such as the use of the surplice instead of the gown, intoning the prayers and singing the responses, the elevation of the communion table into an altar, the substitution of low open benches for high pews—all of which, though claiming to be a restoration of ancient usage, and to have the authority of the law, were regarded with alarm as novelties, and as approximating to the Church of Rome. 3. Another effect of the Tractarian movement was the remarkable impulse given to the building and restoration of churches, and the revival of Gothic architecture, which has been manifested in all parts of England, and given a character to the ecclesiastical buildings of the present century which will mark them for ages to come. 4. The Tractarian movement has undoubtedly been the cause of the secession of many English clergy and laity, some of them men of considerable ability and distinction, to the Church of Rome, which has greatly increased the strength and influence of that communion in the country, and caused great scandal to the Protestant part of the population. Lastly, The movement may, however, be admitted to have produced a great increase of learning, piety, and devotedness among the clergy, and the establishment of colleges, sisterhoods, and other religious and charitable institutions.

TRA'CTION. See FRICTION.

TRADE, BOARD OF, a department of the British government, entitled 'The Lords of the Committee of Her Majesty's Privy Council appointed for the Consideration of all Matters relating to Trade and Foreign Plantations.' In 1660, Charles II created two separate councils for Trade and for Foreign Plantations, which, in 1672, were consolidated into one. The Board of Trade and Plantations, after being abolished in 1675, reappointed in 1695, and passing through various modifications, was again abolished in 1782, when its duties were transferred to the Secretary of State in so far as regarded the management of the colonies, and to a committee of Privy-council as regarded the other business. In 1786, the presently existing department was established by Order in Council, being a permanent committee of Privy-council for the consideration of all matters relating to Trade and the Colonies. The Board consists of a president and vice-president, together with the Lord Chancellor, the Archbishop of Canterbury, the First Lord of the Treasury, the principal Secretaries of State, the Chancellor of the Exchequer, the Speaker of the House of Commons, the Chancellor of the Duchy of Lancaster, the Paymaster of the Forces, the Treasurer of the Navy, the Master of the Mint, and such officers of state in Ireland as are privy-councillors in England. Practically, none of the members of the Board take part in its deliberations except the president and vice-president. The clerks of the Council are *ex officio* secretaries of the Board, but their duties as such are performed by two assistant-secretaries.

The functions of the Board of Trade are partly of a ministerial, partly of a judicial kind, and have of late years been greatly enlarged by a variety of statutes. The Board is charged with the general superintendence of all matters relating to the mercantile marine. It requires and considers reports made to its inspectors and other officers, and orders returns of various kinds regarding trade and navigation. In the exercise of a certain amount of control over marine boards, it is empowered to make regulations regarding the examination and qualifications of applicants for the position of master or mate of passenger-ships. Under 17 and 18 Vict. c. 104, it grants licences to persons to engage or supply seamen or apprentices for merchant-ships, decides on claims for wages, and investigates charges of misconduct and incompetency. In virtue of 14 and 15 Vict. c. 79, it appoints officers to inquire into and report on the condition of steam-vessels.

The supervision of railways and railway companies, both as to their original formation and their working, constitutes an important part of the duties of the Board of Trade. Railways were first subjected to government control by 3 and 4 Vict. c. 97 which conferred power on the Board of Trade to appoint inspectors of railways, to approve or disallow by-laws, to require returns of traffic, and to decide disputes between connecting lines. Further powers were added by 5 and 6 Vict. c. 55. In 1846, the increase of these duties, arising from the rapid extension of railways, led to the transfer of this department of the Board of Trade to a separate Board, created exclusively for the management of railway business; but in 1851 this latter Board was abolished, and its powers again transferred, by 14 and

15 Vict. c. 64, to the Board of Trade. Notices of applications for railway acts, with plans, are required to be deposited with the Board before any bill can be introduced into parliament; and before any railway can be opened for traffic, the permission of the Board must be obtained, on the report of an inspector. On the occurrence of an accident, notice must be given to the Board, which sends an inspector to inquire into the circumstances, and, on his report, the Board is empowered to take what steps are judged necessary for the security of the public.

A statistical department of the Board was established in 1832, whose province is to collect and publish tables containing classified information regarding the revenues, population, commerce, wealth, and moral and economical condition of the United Kingdom and its dependencies, to prepare a selection from the statistics of foreign countries, and a monthly account of trade and navigation. All applications made to the Queen in Council by companies or private persons for charters of incorporation, are referred to the Board of Trade; and among the functions committed to it by statute are the registration of joint-stock companies, and of copyright in designs. The Board is empowered by several local and personal acts to control the proceedings of the commissioners for regulating the employment of coal-whippers, and the discharge of coal-laden vessels in the port of London. In 1853, the Department of Science and Art, which owed its origin to suggestions made in the Second Report of the Commissioners for the Exhibition of 1851, and was at first a department of the Committee of the Privy Council on Education, was placed under the control of the Board of Trade; but in February 1856, it was retransferred, by an Order in Council, to the Committee of the Privy Council on Education.

The Board of Trade known as the Chamber of Commerce of the City of New York, was chartered in 1770. It interests itself in the consideration of questions relating to finance, currency, insurance, postal, and telegraph affairs, commerce, revenue, laws, lighthouses, railroads, canals, home trade and productions, pilotage, &c. Almost every enterprising city in the United States has its Board of Trade.

TRADE CORPORATIONS. See Corporation, and Joint-stock Company.

TRADE, Liberty to, is one of the rights incident to all persons by the law of England. So absolute is this right, that it is considered by courts of law to be an illegal and void covenant when a person, however deliberately, engages never to trade, for it is against public policy to support it. In the sale of the good-will of a business, such covenants are sometimes resorted to, in order to prevent the party selling a business from setting up immediately afterwards the same business, and so defeating the object of the transaction. Accordingly, in all such cases, the courts have arrived at the following result: If a person engage absolutely not to carry on a particular business anywhere, his engagement is void, and not binding; but it is competent for him to engage not to carry on a particular trade within a certain specified reasonable distance—as 20 or 30 miles—from a certain point, the reasonableness being estimated according to the nature of the trade and locality. If this engagement were not legal, it would be impossible to negotiate the sale of the good-will of a business. Subject to the above restriction, any person may carry on trade in any locality he pleases. But in the case of an alien enemy, a licence of the crown is necessary to enable a subject to carry on trade with him. It was also anciently a maxim, now obsolete, that none of the king's subjects could lawfully trade with a nation of infidels without the king's leave, because of the danger of relinquishing Christianity. Though, at common law, every man is free to carry on what trade he pleases, still there are a great variety of lawful trades which are subjected to certain restrictions, either ostensibly for purposes of revenue, or for the purpose of protecting the public from certain evils attending such trades. Thus, attorneys, publicans, manufacturers of cotton, &c., chimney-sweepers, and many miscellaneous employments, are subject to various restrictions. Formerly, also, the liberty to trade was considerably impeded by the ancient corporations and guilds; and it was a practice for these guilds to impose certain conditions on all persons who sought to trade in large towns, otherwise they were excluded from certain commercial as well as political privileges. As the by-laws which were the instruments of creating these restrictions were often authorised by charter of the crown, or grew up by ancient use and custom, then in harmony with the spirit of the age, the courts had a difficulty in treating them as illegal. But by the Municipal Corporations Act which passed for England in 1835 (5 and 6 Will. IV. c. 76), these restrictions were abolished. That act recited that, in divers cities, towns, and boroughs, a certain custom had prevailed, and by-laws had been made that no person, not being free of a city, town, or borough, or of certain guilds, mysteries, or trading companies, should keep any shop, or place for putting to show or sale any wares or merchandise for hire, gain, or sale; and it enacted that henceforth, notwithstanding such customs or by-laws, every person in any borough might keep any shop for the sale of all lawful wares and merchandise by wholesale or retail, and use every lawful trade, occupation, mystery, and handicraft, for hire, gain, sale, or otherwise within any borough. The city of London, however, was excepted from that act, and some of these old restrictions still flourish there. The law in Scotland and Ireland was also altered at the same time. The repeal of the Navigation Laws (q. v.) has also removed many restrictions on those who traded with ships.

TRADE-MARKS. The attaching of peculiar marks, by which manufacturers seek to distinguish their own productions from those made by other persons, is an important privilege, both as concerns the producer and the consumer; because no honest manufacturer will invent and apply a trade-mark to his wares, unless he is convinced that they possess some special excellence, which he wishes thus to make known; and it is desirable the public should have the benefit of such direction in the choice of their purchases as is thereby afforded. Nevertheless, until 1862, the law in Great Britain was in a very unsatisfactory state upon this subject, and the marks of celebrated manufacturers were pirated with the most reckless audacity both by British and foreign firms, in most cases, to enable them to pass off upon the public articles of very inferior character. For such infringement, the only remedy was to proceed by injunction from the Court of Chancery, a process which was far too troublesome and costly for the class of inventors most likely to be injured. The 'Merchandise Marks Act' of 1862 has remedied this evil, and simplified the whole matter, by making it a misdemeanour to forge or counterfeit any trade-mark, or falsely to apply any such trade-mark with intent to defraud, whether applied to a cask, bottle, stopper, vessel, case, cover, wrapper, band, reel, ticket, label, or any other thing, in or with which any commodity is sold, or intended to be sold. It is henceforth an offence to sell or expose, either for sale or for any purpose of trade

or manufacture, articles with forged or false trade-marks, under a penalty of a sum equal to the value of such articles, and a sum besides not exceeding £5, or less than 10*s*. Every addition to, or alteration and imitation of, any trade-mark made with intent to defraud—the intent being the essence of the offence in all cases—is to be deemed a forgery, and punished as such—viz., in addition to the penalties for misdemeanour, by the forfeiture of every instrument used for the purpose of the fraud, and of every article to which the false mark shall be applied. It is further made obligatory on every person who shall sell an article having a false trade-mark to give information as to where he procured it, on a demand for such information being made to him in writing; and in the case of refusing to do so, he can be summoned before a justice of the peace, and fined £5.

Trade-mark in the United States.—A symbol, emblem, or mark, which a tradesman puts upon or wraps or attaches in some way to the goods he manufactures, or has caused to be manufactured. It may be in any form of letters, words, vignettes, or ornamental design. Newly-recognized words may form a trade-mark. *Burnett* v. *Phalon*, N. Y. Superior Court, 1859. A common name of an article and of a place may by combination become a trade-mark. 2 *Bosw.*, N. Y., I. Alien merchants and traders have the same right and protection in regard to their trade-marks as citizens. 2 *Woodb. and M.* C. C., 1. In the examination of conflicting trade-marks the courts will judge as would the public, and mere variation of arrangement of a trade-mark, with secondary additions and omissions, will justify an injunction. Where goods with a false mark are made for a foreign market, an injunction will stop them, and injunctions have been granted where there have been parties of the same name and the similarity of trade-marks has been carried to the conclusion of simulation.

TRADE PROTECTION SOCIETIES are associations composed of merchants, tradesmen, and others, which have been formed for the promotion of trade, and for protecting the individual members from losses in their business transactions with each other, and with the community at large. They began to spring up about the middle of the last century—one of the first started in this country being the 'London Association of Guardians for the Protection of Trade,' which was established in 1776. The operations of these societies, during the earlier years of their existence, were confined chiefly to the compilation of registers of bankruptcies, insolvencies, and private settlements with creditors. The registers were formed thus: Each member informed the secretary of the society with which he was connected of the name, occupation, and address of each of his customers who became insolvent, with the amount of dividend his estate yielded; and latterly, the circumstances connected with such insolvency, whether it had been caused by recklessness or extravagance on the part of the bankrupt, or by innocent misfortune. These circumstances were carefully recorded, and the information thus collected having been found useful, means were taken to render the registers more complete. With this view, new sections were added to the registers, and special attention was directed to the exposure of swindlers, and persons who had been guilty of fraud or embezzlement. The information accumulated in the registers, though always accessible to such members as made inquiry at the offices of the society, was kept strictly private from all others. But the extraordinary development of commercial enterprise which took place in the early part of this century, added a new stimulus to the trade protection movement. The registers which the societies now printed and circulated among their members contained transcriptions from the following public records; viz., the records of the bankruptcy courts, registers of assignments and trust-deeds, bonds or warrants of attorney, bills of sale, judges' orders, protested bills, and decrees in absence. In addition to the diffusion of information of this description, the societies undertook to recover past-due bills and accounts for their members, to investigate the circumstances connected with bankruptcies and insolvencies, collect dividends, and perform the general agency business of their members—the whole being done under the direction of a committee appointed for this purpose. Committees were also appointed to scrutinise all measures affecting trade and commerce which might be introduced into parliament, and to promote legislation favourable to the commercial interest. The sphere of action of trade protection societies thus rapidly widened, and their utility kept pace with their growth. The older societies established offices and branches throughout the country; and new societies sprang up in the large provincial cities, which in their turn opened agencies and branches in every important town and village in their respective districts; and the various societies being in mutual communication, the machinery of the whole is available for the purposes of each.

TRADES' UNIONS. See SUPP. in Vol. X.

TRADE-WINDS. See WINDS.

TRADI'TION. See RULE OF FAITH; INFALLIBILITY.

TRADU'CIANISM (Lat. *traducianismus*; from *tradux*, a 'vine-layer' for propagation), one of the theories adopted for the purpose of explaining the production of the soul in the procreation of the human species. The theory known as traducianism is ascribed to Tertullian as its first author; and is elaborately explained and defended by him in his book *On the Soul*, written after he had lapsed into the Montanist heresy. In opposition to others who had held the theory of the pre-existence of souls, of which pre-existing souls one is divinely infused, or, by some natural affinity, is attracted into each fœtus so soon as it has been formed by generation in the procreation of man, Tertullian taught that souls are propagated by souls as bodies by bodies, and by the same or a simultaneous process. In another place he describes this origin of soul from soul as generation, and even of a class analogous to corporeal generation; and this more gross and material exposition of the theory of traducianism is sometimes called *Generationism*; which, however, is commonly looked upon as a totally distinct theory. A third hypothesis as to the origin of the soul suggested that, in the propagation of the human species, whenever a human body is formed by generation, the soul which is to animate that body is created, and by divine power infused into it. This theory is called *Creationism*. The discussion of these theories in the 4th and 5th centuries was much promoted by the controversies on Manichæism. See MANICHÆANS.

TRAFA'LGAR, CAPE, a low promontory on the south coast of Spain, about 29 miles west-north-west of Tarifa (q. v.), on the Straits of Gibraltar It is memorable for the great naval victory obtained off its shores by the British fleet under Nelson, over the combined fleets of France and Spain, under the French commander Villeneuve and two Spanish admirals. The British force consisted of 27 sail of the line, 4 frigates, 1 schooner and 1 cutter; the force of the French and Spaniards united amounted to 33 sail of the line, 5 frigates, and 2 brigs. It may be remarked that the largest of the enemies' ships carried 30 guns more than the

largest of the British ships. The engagement resulted in a splendid victory for the British, who captured nineteen of the enemies' ships. The victory, however, was gained at the cost of the life of the greatest of English admirals. See NELSON.

TRA'GACANTH. See GUM.

TRA'GEDY. See DRAMA.

TRA'GOPAN, a genus of birds of the family *Phasianidæ*, having the head crested, but naked on the cheeks and around the eyes; a horn-like caruncle projecting backwards from behind each eye; and a loose wattle, capable of being inflated, hanging beneath the bill. The tarsi are armed with a blunt spur in the male, unarmed in the female.

Tragopan, or Horned Pheasant (*T. satyrus*).

The species are few, and are natives of Asia. They are birds of beautiful plumage, somewhat resembling pheasants, but of more bulky form, and with rounded tails of moderate length. The first-known species (*T. satyrus*) has been called the *Horned Pheasant*. It inhabits the higher parts of the Himalaya, Tibet, and some of the mountainous provinces of China. The tragopans seem particularly deserving of attention, as capable of acclimatisation in Britain, and probably of domestication.

TRAIN-BANDS (or, more properly, TRAINED BANDS), a force of militia, and not differing essentially from that force, substituted by James I. for the old English Fyrd, or national militia. The train-bands of London were chiefly composed of apprentices; and their unruly doings formed the subject for many facetious plays and tales. In the civil wars, the train-bands sided with the Parliament; and Charles II. restored the militia on its old local footing.

TRAINING, applied in a Sporting sense, implies the acquisition of the most vigorous and perfect health, and is used alike in reference to men, horses, and dogs. An individual is said to be trained 'in condition,' when he has by certain processes rendered his frame as fit as it is possible for it to be, for performing some feat of strength or endurance—such as undergoing a pugilistic encounter, a wrestling match, or a trial of speed, or any other prolonged exertion. To accomplish this end, a long course of training is often gone through, in many instances of a very severe nature. It being necessary to divest the muscles of every particle of fatty tissue which can possibly be got off without direct injury to the health, it often happens that many pounds of flesh are required to be dispersed, and the most severe and continued exertion, the body being wrapped in thick suits of flannels, denominated 'sweaters,' is necessary. Constant hard and sharp exercise in this fashion, combined with rigid abstinence, and a strict regard to other established laws of the art, are a *sine quâ non* in getting the body into the height of condition. For example, however thirsty the person training may be, after perhaps ten miles' rapid walking in a triple suit of sweaters, he must drink but very sparingly, for although he may have taken off pounds of flesh by profuse perspiration, one glass of ale would undo the whole effect. Great attention to diet is necessary. Indeed, much of the system may, as a modern writer has aptly expressed it, be laid down in the resolute performance of the three cardinal virtues—temperance, soberness, and chastity. Almost the same course is pursued towards animals; and whether for hunting or racing, horses and dogs have to submit to a course of training to bring them into condition. Lately, the Turkish bath, as a means of procuring the necessary reduction of flesh without such excessive labour, has been found a most efficient ally in training. Out of condition, the muscles are flabby, confused, and coated with fat; the skin dead and lifeless; the eye dull and heavy; the lungs labouring, and the movements slow. In condition, the muscles stand out hard, clear, and defined; the tendons shew like cords; the skin is clear and ruddy; the eye bright; the lungs play with unrestrained freedom; and the whole frame is endued with vigour and perfect activity. Animals, from their less artificial existence, require far less training than men to bring them into condition.

TRA'JAN'S COLUMN, a celebrated column at Rome, which was reared, 114 A.D., by the Roman senate and people, in honour of the Emperor Trajan. It is considered not only the greatest work of its architect, Apollodorus, but one of the noblest structures of its kind ever erected. The pedestal is covered with bas-reliefs of warlike instruments, shields, and helmets; and a very remarkable series of bas-reliefs, forming a spiral round the shaft, exhibits a continuous history of the military achievements of Trajan. These are in excellent preservation, and, independently of their beauty as works of art, they are invaluable as records of ancient costume. A spiral staircase in the interior of the column leads to its summit. The height of the entire column is 132 feet. It still stands erect in all its ancient beauty amid the ruins of Trajan's forum. The summit was originally crowned by a colossal statue of the emperor, which has been incongruously replaced by one of St Peter.

TRAJAN'S WALL, a line of fortifications stretching across the Dobrudscha from Czernavoda, where the Danube bends northwards, to a point of the Black Sea coast near Kustendji. It consists of a double, and in some places a triple, line of ramparts of earth, from $8\frac{3}{4}$ to 11 feet in height on the average (though occasionally it attains an altitude of $19\frac{1}{2}$ feet), bounded along its north side by a valley, which, being generally marshy, and abounding in small lakes and pools, serves admirably the purpose of a fosse. This valley was long erroneously supposed to have been at one time the channel by which the Danube emptied itself; and a scheme for utilising it by the construction of a canal to provide a more commodious water-communication with the Black Sea, in lieu of the long and troublesome navigation by the Sulina mouth, has been frequently mooted, and is undoubtedly quite practicable; but the cost of the undertaking has hitherto been a bar to its execution. During the war of 1854, Trajan's Wall became an important line of defence on the invasion of the Dobrudscha by the Russians, and the invaders were twice defeated in their attempts to pass it—at Kostelli (10th April) and Czernavoda (20—22d April).

TRAJA'NUS, MARCUS ULPIUS, Roman emperor, was born at Italica (Alcala), near Seville, 18th

September 52 A.D. He was descended from a family which was probably of Roman origin, and was early trained to arms, becoming a prominently successful leader in the Parthian and German campaigns, during the reigns of Titus and Domitian. He was rewarded for his valuable services by promotion to the offices of prætor and consul (91 A. D.), and was ultimately adopted (97 A. D.) by Nerva (q. v.) as his colleague and successor. T. became sole ruler in January of the following year, and celebrated the event of his accession by the usual largess to the soldiers, which gift his liberality prompted him to extend also to the Roman citizens and their children; and he made large provision out of the imperial treasury for the upbringing of the children of poor freemen in Rome and other Italian towns, with the view of encouraging the increase of the population. In 101 A.D., Rome, for the first time, beheld its emperor leading forth his legions in person on a career of conquest, when T. set out on his first campaign against the Dacians who had exacted tribute from Rome since Domitian's time. The struggle was long and destructive; the emperor's opponents were valiant warriors, and headed by an able leader, their monarch, Decebalus; but the Romans at last gained a decisive superiority; and in a subsequent campaign (104—105) completely subdue their opponents, whose country thenceforth became the Roman province of Dacia, and was secured by partial colonisation. This conquest, the first since the death of Augustus, was celebrated, on T.'s return to Rome, by a triumph, and by games on a most extensive scale, which continued for four months. Thirst for dominion again impelled T. to the east in 106 A.D. Landing in Syria, he marched northwards, received on his way the submission of numerous princes, possessed himself of Armenia, which he made a province of his empire, and hugely gratified the Roman senate with long lists of monarchs, never before heard of, who had bowed to their sway. The record of the events of the next seven years of T.'s reign is extremely defective, the few notices in Dion Cassius and others being insufficient for the construction of a consecutive narrative. In 115 A. D., he again set out from Syria, directing his march this time against the degenerate Parthian Empire; took Ctesiphon almost without a struggle; and descending the Tigris, and subduing the tribes on both banks, became the first and only Roman general who navigated the Persian Gulf. On his return, he found that, like the bent reed which recovers its position when relieved from pressure, the peoples of Mesopotamia, North Syria, and Arabia required to be again and more thoroughly subdued. This being done, and Parthia again conquered, T., sinking under a combination of dropsy and paralysis, which had long afflicted him, attempted to reach Italy, but was overtaken by death at Selinus, in Cilicia, August 117. Though most of T.'s reign was spent in the gratification of his warlike ambition, the internal administration was far from being neglected; the administration of justice was vigorous and impartial; that of finance was equally acceptable; informers (*delatores*) were severely punished, and peculating governors of provinces rigorously prosecuted. The improvement and beautifying of Rome—a favourite occupation of the emperors—was carried on: the empire was traversed in all directions by new military routes, canals and bridges were constructed, new towns built, the Via Appia was restored, the Pontine Marshes partially drained, the magnificent 'Forum Trajani' erected, and the harbour of Centum Cellæ (Civita Vecchia) constructed. Even if there were not abundant evidence of the sincere desire of T. to increase the comfort and happiness of his subjects, the customary wish formally uttered on the occasion of an emperor's accession, that he might be 'happier than Augustus, better than Trajan' (*Augusto felicior, Trajano melior*), would of itself suffice for proof. During T.'s reign, a persecution of the Christians, of a mild character, took place; and taking into account that T. almost necessarily shared the general belief that Christianity was a perilous species of fanaticism, his conduct towards them deserves, perhaps, to be entitled moderation.

TRAJE'CTORY, in Mathematics, is any plane curve which cuts at a given angle a series of plane curves of the same species and having a common origin. In Mechanics and Astronomy, it denotes the path described by any body projected into space, and continuously acted upon by constant or varying forces; thus, the trajectory of a body projected obliquely for a little distance above the earth, is approximately a parabola (it would be accurately so, were space void, and the centre of gravity of the earth infinitely distant), and the trajectories of the planets are approximately ellipses; the term, however, was long, in astronomy, exclusively applied to the paths of comets.

TRALEE', a seaport and parliamentary borough of Ireland, chief town of the county of Kerry, stands on the river Lee, about a mile from the point at which it enters the sea, 162 miles west-south-west from Dublin, with which it is connected by the Great Southern and Western and Killarney Railways. The pop., in 1871, was 9512, of whom 8567 were Roman Catholics, and 945 Protestant Episcopalians; in 1881, 9664. The first origin of T. was due to the building of a castle, and the foundation of a Dominican convent by the Geraldine family, in 1213; and somewhat later, a considerable House of the order of Templars was established. The borough is now under the management of commissioners, who dispose of a revenue amounting, in 1862, to £2226. It returns one member to the imperial parliament. The town is well built, and possesses many public buildings. A large traffic in grain and agricultural produce is carried on, the annual exports amounting to £200,000, and imports to about £150,000. There is a ship-canal, by which vessels discharge their cargoes close to the town.

TRAM. See SILK.

TRA'MMEL-NET, a kind of net resembling the drift-net used in the Herring-fishery (q. v.), but anchored and buoyed at each end, the back-rope supported by small cork-floats, and the foot-rope kept close to the ground by weights. The length varies from twenty to three hundred yards. A variety of trammel-net, chiefly used in the west of England and in Guernsey, consists of three long nets fastened together at top, bottom, and ends. The two outer nets are each five meshes deep, the meshes ten inches square; the middle net is twice as long and deep as the outer ones, but the excess at the edges is gathered in and united all round with the other nets. The outer nets stand with their meshes square and opposite one another, and a fish, in passing through the first net, meets the second or middle net—which, being slack, yields to the pressure—and is carried through the opposite large mesh of the third net into a loose bag or pocket, from which it cannot escape. This net is much used for taking red mullet, and in some parts of Cornwall is called a *tumbling-net*.

TRAMWAY. See RAILWAYS.

TRANCE, or **MORBID SLEEP**, differs from natural repose in duration; in profound insensibility

to external impressions; in following excitement and the exaltation of certain instincts, chiefly the religious and amative, rather than fatigue or exhaustion; and in being the concomitant or symptom of diseases of the nervous system. The attitude, aspect, lowered respiration, and circulation of the entranced, resemble those of the sleeper. But there are many exceptions to this observation. A girl who remained dormant for 13 years, although she grew from a child to a woman in that time, was corpse-like in appearance, had locked-jaw, and there was all but a total suspension of the signs of life. But while an individual cannot be roused from this condition by the most powerful stimulants, an electric shock, or even, it is affirmed, by a surgical operation, thought or dream goes on uninterruptedly, and is more continuous and coherent in character than what takes place in ordinary sleep. So connected and real do these visions appear to the ecstatic, that they are generally accepted as true events, revelations, or impressions, received during a brief visit to another world. Trance has occurred epidemically during periods of great religious fervour and superstition; and whole classes of persons are described as having preached while asleep, in the insurrection of the Cevennes. A similar phenomenon has recently (1865) been observed in those affected by hysteromania at Morzine in Savoy. The affection has been divided, according to the intensity of the symptoms, into (1) *Death-trance*, where neither the heart nor lungs act; where the temperature of the body falls; where no sustenance is taken, and the inner dream-life is the only vestige of vitality. Engelbrecht, who was subject to trance, wrote a book descriptive of this inner life, during which he believed himself to be transported to supernatural, if not to heavenly regions. (2) *Trance-coma*, where the breathing and action of the heart are feeble, but perceptible; the joints flexible; but where the external senses are not awake, and where the patient cannot be roused. (3) *Trance-sleep*, where, except in the insensibility to external stimuli, and in the length of the suspension of volition, little abnormal is noticed. As these states often succeed hysteria, nervous and other diseases, the bodies of the supposed dead are for a time, in certain countries, so placed as to be watched, and in circumstances favourable to resuscitation.—Mayo, *On the Truths contained in Popular Superstitions*, p. 88; Figuier, *Histoire du Merveilleux dans les Temps Modernes*, t. ii. p. 38; Dendy, *The Philosophy of Mystery*, p. 367.

TRA′NI, a maritime city of Southern Italy, in the province of Terra di Bari, 25 miles north-west of the town of Bari. Pop. about 25,000. It is surrounded by a wall with towers and moats, and entered by three gates. T. is an archbishop's see, and has a handsome cathedral, convents, a court of appeal, a theatre, and a strong castle. The streets are wide, well built, and paved with flagstones. There is a handsome square. A considerable trade in oil, wine, corn, and cotton, which last is also manufactured here, is carried on.

T. comes first into notice when it submitted to the Normans in 1053. It was then the chief town of a vast county, and was an important harbour in the time of the Crusades. Under the kingdom of Italy, it has again begun to prosper, and promises once more to become an emporium of the commerce of the Levant, as it was in the middle ages.

TRANQUEBA′R, a corruption of *Tallangambadi*, a seaport town on the east coast of British India, 155 miles south of the city of Madras. It stands on a small bay, and is backed by a well-wooded and cultivated country; is a healthy station, much cooler than Madras, and has therefore been made a convalescent dépôt. The town is surrounded by walls, with bastions, and is further protected by the fort of Dansborg. The territory of T. embraces 15 sq. m., and produces rice, the cocoa-nut and other palms, the mango, and a variety of fruits. The town itself contains about 25,000 inhabitants. The territory passed finally into the hands of the English—the Danes having been its former possessors—in 1845.

TRANSCAUCA′SIA, the tract of territory belonging to Russia, and extending between the Caucasus (q. v.) on the north, and Turkey in Asia and Persia on the south. This name, however, has no practical geographical significance, as the Russians include the territory which it denotes in what they call the Caucasus, which comprises the governments of Stavropol, Tiflis (q. v.), Koutaïs, Elizabethpol, Bakou, and Erivan, and several territories. The area of the Caucasus is 168,880 square miles; pop. (1867) 4,661,824.

TRANSCENDE′NTAL, TRANSCENDENT (*transcendentalis, transcendens*), words employed by various Schoolmen, in particular Duns Scotus, to describe the conceptions that, by their universality, rise above or transcend the ten Aristotelian Categories (see CATEGORIES). Thus, according to Scotus, *Ens*, or Being, because it is predicable of Substance and Accident alike, of God as well as of the World, is raised above these by including or comprehending them; it has the same relation to the sum of the Categories, as the *summum genus* to the various genera within a single category—Relation (*summum genus*) to the classes of Related things (included genera). Further, the predicates assumed by Scotus to belong to *Ens*, or simple existence; viz., the One, the True, the Good—*Unum, Verum, Bonum*—are styled transcendent, because applicable to *Ens* before the *descent* is made to the ten classes of real existence. In later times, since Kant, the word Transcendental has been largely used as equivalent to the philosophical meaning of *à priori*. See COMMON SENSE, INSTINCT.

Between the hitherto convertible terms, Transcendental and Transcendent, Kant himself drew a distinction, of considerable importance in understanding his own system. By the word 'Transcendental,' he designates the various forms, categories, or ideas assumed to be native elements of human thought; implying that, although they are not products of Experience, they are manifested only in experience; such are Space and Time, Causality, &c. The word 'Transcendent,' Kant reserves for those among the transcendental or *à priori* elements that altogether transcend experience. They may seem to be given in experience, but they are not really given. Such are the 'Ideas of the Pure Reason,' God, an Immaterial Soul, &c. Transcendental elements, when legitimately applied to experience, as Causality and Relation, are called Immanent.

TRA′NSEPT, the projecting wings on the north and south sides of a church, forming the smaller arms of the cross, in the ground-plan of cruciform churches.

TRA′NSFERENCE, in the Law of Scotland, means the step by which a pending suit is transferred from a person deceased to his representative.

TRANSFU′SION OF BLOOD has been regarded as a recognised and legitimate operation in obstetric surgery since the year 1824, when Dr Blundell published his well-known work, entitled *Physiological and Pathological Researches*. The operation had, however, been vaguely known to the

medical profession for the last four centuries; and there are obscure allusions in the Roman poets, which would seem to indicate that it was practised as early as the Augustan age:

> Ut repleam vacuas juvenili sanguine venas.
> *Ovid.*

The earliest authentic case on record is, so far as we know, that of Pope Innocent VIII., who was unsuccessfully operated on in April 1492. 'The vital powers of Innocent VIII. rapidly gave way; he had for some time fallen into a kind of somnolency, which was sometimes so profound that the whole court believed him to be dead. All means to awaken the exhausted vitality had been resorted to in vain, when a Jew doctor proposed to do so by the transfusion, by a new instrument, of the blood of a young person—an experiment which had hitherto only been made on animals. Accordingly, the blood of the decrepit old pontiff was passed into the veins of a youth, whose blood was transferred into those of the old man. The experiment was tried three times, and at the cost of the lives of three boys, probably from air getting into their veins, but without any effect to save that of the pope.'—Villari's *Life of Savonarola.* Although Libavius, in 1615, accurately describes the operation, there is no evidence that he ever practised it. Passing over various experiments by Wren and Lower (both of Oxford) in the transfusion of blood from one animal to another, we find Denys of Montpellier, in June 1667, injecting the blood of calves into the veins of a young man who had been much weakened, and had become torpid and slightly dropsical, in consequence of repeated bleedings. The first operation restored him to perfect health. Subsequent cases of his gave rise to a most virulent controversy, which ended with the decision, 'that for the future, no transfusion should be made upon the human body but by the approbation of the physicians of the Parisian faculty.' In November of the same year, Lower publicly made a similar experiment, which seems to have been successful; and in the following year, Riva and Manfridi repeated the experiment in Italy. But the operation, although thus fairly started, soon fell into obscurity, doubtless from a want of success, due partly to the blood of calves and sheep, instead of human blood, being used, and partly to hopeless cases of old age and decrepitude being selected for its application.

At the present day, transfusion is an operation which is almost always restricted* to cases of profuse hæmorrhage in connection with labour; and as Dr Playfair, in his excellent *Handbook of Obstetric Operations* (Lond. 1865), observes: 'The benefits derived from it are probably twofold: 1. The actual restitution of blood which has been lost; and 2. The supply of a sufficient quantity of blood to the heart, to stimulate it to contraction, and thus to enable the circulation to be carried on until fresh blood is formed. Its stimulant action is probably of far the most importance; and if the operation is performed before the vital energies are entirely exhausted, the effect is most marked, and indeed may be said to be almost unfailing.'—Pp. 212, 213. Blundell was in error in believing that the blood of animals of the same species was essential; Dr Brown-Sequard having since shewn that the blood of various animals can be used indiscriminately, provided only certain precautions are taken; and the important* discovery has recently been made by Panum, that defibrinated blood is in every respect as well suited for the operation as pure blood.

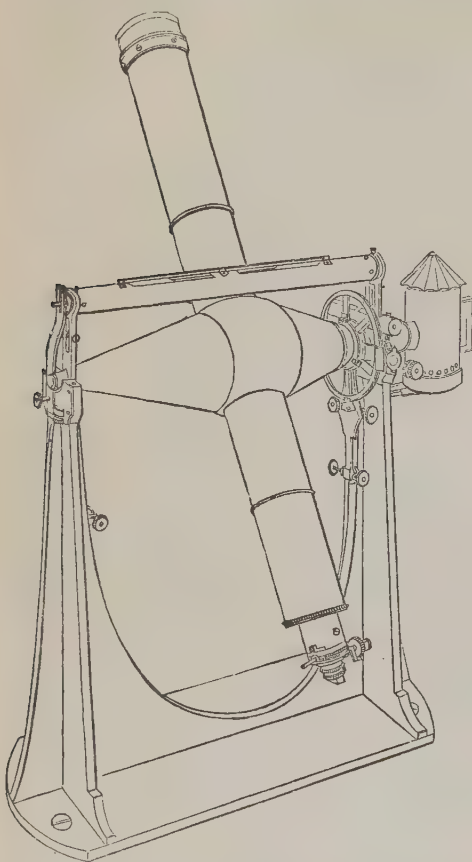
'The cases suitable for the operation,' says Dr Playfair, 'are those in which the patient is reduced to an extreme state of exhaustion from hæmorrhage during or after labour or miscarriage. The operation will not come into contemplation until other and simpler means have been tried and failed, and when the symptoms indicate that life is on the verge of extinction.' The value of the operation in suitable cases is proved by statistical evidence. Mr Soden of Bath has recorded 36 cases, in 29 of which the patients were rescued from an apparently hopeless state; and out of 57 cases recorded by Professor Martins of Berlin, 43 were entirely successful, and 7 temporarily so. Of the various syringes that have been invented for this operation, Dr Playfair gives the preference to that of Dr Graily Hewitt. The blood to be injected should be taken from the arm of a strong and healthy man who can spare a sufficient quantity, since a change of persons leads to delay, and should therefore be avoided. Generally speaking, from four to six ounces of blood are sufficient, but more may be required. It would be out of place to enter, in these pages, into details regarding the mode of performing the operation. They are fully described in Dr Playfair's work.

TRA'NSIT-INSTRUMENT, one of the most important of astronomical instruments, consists of a telescope fixed to a horizontal axis, so as to revolve in the plane of the meridian, and is employed, as its name denotes, in the observation of the meridian transits of the heavenly bodies. The axis, which is the most important part of the instrument, and thus demands the utmost care in its construction, consists of a hollow sphere or cube, to opposite sides of which are tightly fastened the bases of two cones in whose apices the pivots are screwed; the sphere or cube is pierced for the admission of the telescope, which is firmly soldered at right angles to the axis. One of the pivots is hollowed so that a stream of light can be directed from a lantern half way along the interior of the axis, and through an aperture in the side, into the telescope tube, where, being received by an annular mirror, set at 45° to the axis and telescope tube, it is directed to the eye-piece, and brilliantly illumines the field of view, while the annular form of the mirror prevents any interference with the passage of rays from the object under observation to the eye. The pivots must be very carefully turned to a perfectly cylindrical form, and fitted into the instrument, so that their axes are accurately in line. One extremity of the axis carries one and sometimes two small graduated circles, each supplied with index, clamping screws, and vernier; these circles are capable of indicating angular measures to within 1′ or 2′. The pivots rest on massive blocks of stone or other stable material which is little affected by change of temperature, stability being the great mechanical essential of the instrument. This condition satisfied, there are three adjustments necessary before a transit can be observed: the axis must be horizontal; the line of collimation must be at right

* A case has lately been recorded in which it proved successful in a case of coma from the fumes of carbonic oxide and carbonic acid; and it is not improbable that it may again come into more general medical use.

* Dr Markham has, we believe, suggested the trial of transfusion of blood in cases of the cattle disease. As it would be impossible, without danger, to bring a healthy animal in contact with a diseased one, the value of Panum's discovery, provided the proposed remedy be successful, is obvious. The blood of healthy oxen, killed for the market, could be defibrinated by whipping and straining, and would remain fit for injection, when raised to the normal temperature, for many hours.

angles to the axis of motion; and the latter must be placed so as to point accurately east and west. On the perfection of the first two of these adjustments depends whether the telescope sweeps over a great circle of the sphere, and the third is necessary to insure that this great circle shall be the meridian of the place of observation. These adjustments can never be made quite perfect, and the usual mode is to investigate the amount of error in each, and allow



Transit Instrument.

for it in the apparent result. To note accurately the instant of time by the astronomical clock at which the object (e. g., a star) is seen to pass the centre of the field of view, is the essential part of a transit observation. The most effective method is to register the beats of the clock by an apparatus, which, at the end of each oscillation of the pendulum, marks a dot upon a uniformly moving slip of paper. This is effected by the agency of electricity, and is one of its most valuable contributions to astronomical science. At a certain point in each oscillation of the pendulum, it becomes part of a complete galvanic circuit, the contact being immediately broken by its progression in its oscillation; and it is at these points that the galvanic agency causes the dot to be made. The instant of a transit's occurrence is similarly noted by the observer, who, by a tap on a break-circuit key, fastened to the side of the transit-instrument, causes the graver to make an extra dot; and the distance of this dot from the previous seconds one, compared with the distance between two seconds dots, gives the time accurately almost to $\frac{1}{100}$th of a second. Various ingenious modes of registering have been proposed, all founded on the above principles. It is from the times of transit of the several heavenly bodies thus accurately observed, that their right ascensions are determined.

The transit-instrument was invented by Römer about 1690, and first described in 1700, in the *Miscellanea Berolinensia*, vol. iii. One was erected in Greenwich Observatory by Halley in 1721; but it was little used till 1742. The present instrument in that observatory is by Troughton, and was erected in 1816.

TRANSI'TION, a term employed at first by Werner to designate rocks having a mineral character intermediate between the highly crystalline or metamorphic rocks and ordinary sedimentary deposits. As these rocks, in the region where the Wernerian classification originated, had a definite relation to the inferior and superior strata, and contained a uniform series of fossil remains, the term gradually came to have a chronological meaning. It was employed to designate similar deposits wherever they occurred. But a more enlarged view of the sedimentary deposits in the different countries of Europe, exploded the idea of a transition either in mineral structure or organic contents being characteristic of any set of beds, and caused the Transition series to be more accurately classified as Cambrian, Silurian, and Devonian strata.

TRA'NSITORY ACTION, in the Law of England, is used, in contradistinction to Local Action, to denote that the particular action may be tried in another county than that in which the occurrence arose.

TRANSLA'TION OF MINISTERS, in the Law of Scotland, means the removal of a minister from one parish benefice to another.

TRANSMIGRA'TION, or the passing from one place, state, or condition into another, means, in the theological acceptation of the term, the supposed transition of the soul after death into another substance or body than that which it occupied before. The belief in such a transition is one of the most important phases in the religions of mankind. It was common to the most uncivilised and the most civilised nations of the earth; it was the object of fantastical superstition, as well as that of philosophical speculation, and it is the property of both ancient and modern times. Its basis being the assumption that the human soul does not perish together with the body, it could belong to those nations only which had already conceived an idea of the immortality of the soul; but in proportion as such an idea is crude or developed, as it is founded merely on a vague fear of death, and a craving for material life, or on ethical grounds, and a supposed causal connection between this and a future life, the belief in transmigration assumes various forms, and influences more or less the actions of men.

The lowest forms of this belief are probably those met with among several tribes of Africa and America, which hold that the soul, immediately after death, must look out for a new owner, and, if need be, enter even the body of an animal. Several negro tribes entertain this belief; they assume that the soul will choose with predilection the body of a person of similar rank to that of its former owner, or a near relation of his; and they frequently therefore bury their dead near the houses of their relatives, in order to enable the souls of the former to occupy the newly-born children of the latter, and the princely souls to re-enter the princely family; and until the soul is thus accommodated, milk, brandy, and food are placed on the grave of the deceased, to keep it, as it were, from starving; and sometimes

holes are dug in the grave, to facilitate the soul's egress from it. In North America, some tribes slaughter their captives, to feed with their blood such souls in suspense. The negro widows of Matamba are especially afraid of the souls of their husbands, for at the death of these they immediately throw themselves into the water, to drown their husbands' souls, which otherwise, as they suppose, would cling to them. The natives of Madagascar seem to have invented a kind of artificial transmigration, for in the hut where a man is about to die, they make a hole in the roof, in order to catch the outgoing soul, and to breathe it into the body of another man on the point of death. From these and instances of a similar kind, it will be seen that nations which entertain such a belief in transmigration, assume that the souls of the deceased must continue to dwell upon earth, and that one human being may be possessed of several souls. With them, the final destination of the soul is a matter of comparative indifference; its transition from one body into another a mere matter of chance, devoid —apparently, at least—of any ethical principle, and therefore without any moral effect on the living, except, perhaps, that of a stolid indifference to death, as often manifested in the plantations of the West Indies, where negroes hang themselves, in the belief that their souls will migrate into other countries, and there enjoy a happier life.

Another, more poetical, and in some respect also, more ideal form of this belief in transmigration, is that which occurs in Germanic mythology, and is still entertained in some parts of Germany and England. According to it, the soul, before entering its divine abode, assumes certain forms, or animates certain objects, in which it lives for a short period. Thus, it is supposed to enter some flower or tree, a rose, a vine, a plantain, a pine-tree; or to nimate a butterfly, a pigeon, and sometimes also— a person dies while enchanted or sleeping—a serent, a weasel, or a mouse. The most popular form f these supposed transmigrations, however, is that of a pigeon, a representation of which bird, therefore, often occurs on the oldest tombstones. When the robber Madej, for instance, under an appletree confessed his crimes, one apple after another, transformed into a white pigeon, flew into the air. They were the souls of the persons murdered by him; only one apple remained, because he had not yet confessed the murder of his father; but when he did so, also the last apple—the soul of his father —assuming the shape of a gray pigeon, flew after the rest.

Different from this kind of belief in transmigration is that which is based on ethical grounds. It proceeds from the theory, that the human souls, being of divine essence are originally pure, but during their earthly career, lose of their purity; being destined, however, to regain their original quality, are reborn again and again, until they have become free from fault, and thus worthy of re-entering the place of their origin.

A belief of this nature was entertained by the old Mexicans, and probably also the Druids. It is met with in a more developed form with the old Egyptians; but its real importance it obtained as a tenet of the religion and philosophy of the Brahmanical Hindus and the Buddhists, whence it passed into the doctrine of several philosophers of ancient Greece, and into that of some Jewish and Christian sects.

The ethical and philosophical value which such a belief may have, is necessarily relative. It will depend on what a religion or philosophy may call right or wrong, virtue or sin; it will likewise depend on the notions which religion or philosophy may entertain on the origin of the human soul, on the cause of its first birth, and on its ultimate destination, whether this destination is the merging of the soul into the essence of the Creator, or a personal immortality; and again, the mode in which such a personal immortality is conceived, will also necessarily influence the mode in which transmigration is supposed to take place.

Where the ideas on these questions have remained crude, the idea of transmigration, too, is but of little ethical or philosophical worth. The old Mexicans imagine that the gods *Ometeuctli* and *Omecihuatl* create in heaven the soul of a child destined to be born, and that by its acts on earth it will either ascend to the abode of the highest felicity, or remain in an intermediate heaven, or fall to hell. The highest goal, situated in the house of the sun with the god *Huitzilopotchli*, is full of pleasure and joy, and is attained merely by the souls of fallen warriors, or those who died in captivity, and women dying in childbirth. The second or intermediate heaven, cool and pleasant, but of moderate enjoyments, falls to the lot of men who are not wicked. The wicked, however, go to the abode of darkness; and in darkness consists their punishment. But those entitled to the second heaven may, if they like, also return to earth, in order to qualify themselves for the highest heaven, if such is their aspiration.

Of the Druids, it is told by classical writers that they believed in the immortality of the soul, and in its migration after a certain period subsequent to death. Little is known of the manner in which they imagined such migrations to take place; but to judge from their religious system, there can be no doubt that they looked upon transmigrations as a means of purifying the soul, and preparing it for eternal life.

According to the doctrine of the old Egyptians, the human race originated after the pure gods and spirits had left the earth; and this they did because the demons, who inhabited the earth, had revolted against them, and therefore tainted it with guilt. But, in order to enable the demons to purge themselves of their guilt, the gods created earthly bodies, which the demons were sentenced to animate, so that by expiations they might regain their state of original purity. And these earthly bodies, united to the demons, are the human race; their souls were therefore created at the same time as that of the gods; and human life—the connection of body and soul—is merely intended as a means of purifying the soul, which had rebelled against its divine nature. All the precepts regulating the course of life are laid down by the Egyptians for this end; and the judgment passed after death, in the palace of Osiris, decides whether it has been attained or not. If it has not, the soul must return to the earth again, to renew its expiations; and according to the nature and measure of the guilt which it had contracted during its previous career, it must form a new union with a human body, or with the body of an animal or even a plant. But if the soul is declared pure by the judge of the dead, it gradually ascends through the various regions of heaven, to the highest abodes of the gods and pure spirits, presided over by Phtah and Neith.

At the time when in *India* the dogma of transmigration became an integral part of the Brahmanic religion, the Hindus believed that the human souls emanated from a supreme Being, which, as it were, in a state of bewilderment or forgetfulness, allowed them to become separate existences, and to be born on earth. The soul, thus severed from the real source of its life, is bound to return to it, or to become merged again into that divine substance with which

it was originally one, but as its nature becomes contaminated with sin through its earthly career, it must, so long as it remains in this world, endeavour to free itself from all guilt, and thus to become fit for its ultimate destiny. Religion teaches that this is done by the observance of religious rites, and a life in conformity with the precepts of the sacred books; philosophy, that the soul will be re-united with Brahman, if it *understands* the true nature of the divine essence whence it comes. So long, therefore, as the soul has not attained this condition of purity, it must be born again, after the dissolution of the body to which it was allied; and the degree of its impurity at one of these various deaths, determines the existence which it will assume in a subsequent life. See INDIA, sec. *Religion and Philosophy*; and UPANISHAD.

Since there can be no proof of the soul's migrations, the detail in which these are described in the religious works of the Hindus, is merely fantastical, and interesting only so far as it affords a kind of standard by which, at various epochs, and by different writers, the moral merit or demerit of human actions was measured in India. Thus, Manu (in the 12th book of his Code of Laws) teaches: 'The slayer of a Brâhman'a—according to the degree of his guilt—is reborn as a dog, a boar, an ass, a camel, a bull, a goat, a sheep, a stag, a bird, a Chân'dâla, or a Pukkas'a. A Brâhman'a, who drinks spirituous liquor, will migrate into the bodies of a worm, an insect, a grasshopper, a fly feeding on ordure, or some mischievous animal. A twice-born who steals (the gold of a Brâhman'a), will pass a thousand times into the bodies of spiders, snakes, and chameleons, of aquatic monsters, or of murderous bloodthirsty demons. He who violates the bed of his guru, will a hundred times migrate into the forms of grasses, of shrubs, and of creeping plants, of carnivorous animals and beasts with long teeth, or of cruel brutes. Those who inflict injury (on sentient beings), become flesh-eaters; and those who eat forbidden things, worms. Thieves become devourers of each other; and those who embrace women of the lowest castes, become ghosts. . . . . If a man, through covetousness, has stolen gems, pearl, or coral, or whatever belongs to the precious substances, he is reborn in the tribe of goldsmiths; if he has stolen grain, he becomes a rat; if kânsya (a composition of zinc and copper), a *hansa* bird; if water, a diver; if honey, a gadfly; if milk, a crow; if juice (of the sugar-cane or the like), a dog; if clarified butter, an ichneumon; if flesh, a vulture; if fat, a shag; if oil, a cockroach; if salt, a cricket; if curds, the crane, called Valâkâ;' &c. A more general doctrine of the migration of souls is based by Hindu philosophers on the assumption of the three cosmic qualities of *sattwa*, i.e., purity or goodness; *rajas*, i.e., troubledness or passion; and *tamas*, i.e., darkness or sin, with which the human soul may become endued. And on this doctrine, again, Manu and other writers build an elaborate theory of the various births to which the soul may become subject. Manu, for instance, teaches that 'souls endued with the quality of *sattwa*, attain the condition of deities; those having the quality of *rajas*, the condition of men; and those having the quality of *tamas*, the condition of beasts.' Each of these conditions, he continues, is, according to the acts or knowledge of the soul, threefold: the lowest, the middle, and the highest. 'The lowest embodiment of the quality *tamas* is inanimate objects, worms, insects, fish, serpents, tortoises, tame and wild beasts; the middle state, to which the same quality leads, is (the state of) an elephant, a horse, a S'ûdra, a Mlechchha or barbarian, a lion, a tiger, and a boar; the highest, that of a public performer, a bird, a cheat, a demon called Rakshas, and a vampire-demon. The lowest condition to which the soul imbued with the quality *rajas* arrives is that of a cudgel-player, a boxer, a public dancer, a man who lives on the use of weapons, and one addicted to gambling and drinking; the middle condition, that of a king, a man of the Kshattriya or military caste, a house-priest of a king, and a man fond of learned controversy; the highest, that of a Gandharva or musician in Indra's heaven, a Guhyaka or Yaksha (two kinds of attendants on the god of riches), or another attendant on another god, or a Apsaras or heavenly nymph in Indra's heaven. The lowest state procured by the quality of *sattwa* is that of a Vânaprastha—or a hermit of the third order of life—a religious mendicant, a Brâhman'a, or one of the demigods travelling about in palace-like cars, one of (the genii presiding over) the lunar mansions, or an offspring of Diti. The middle state, procured by the same quality, is that of a sacrificer, a Rishi (q. v.), a god of the lower heaven (a deity personating one of the) Vedas, (a deity presiding over one of) the luminaries or years, one of the manes or progenitors of mankind, and of the demigods called Sâdhya. The highest condition to which the quality of *sattwa* leads is that of the god Brahmâ, that of a creator of the world (as *Marîchi*, or another patriarch of the same rank), that of the genius of Dharma (virtue or right), of *Mahat*, or the intellectual principle of creation, and of *Prakr'iti*, or matter.' See SANKHYA.

It is not necessary here to shew that this detail regarding the migrations of the souls is more or less differently given by other authors at other periods of Hindu religion, according to the views which they entertained of right and wrong, of the value and rank of imaginary or created beings, and of the social conditions of men. For, since all orthodox Hindu writers agree in principle with Manu, the quotations alleged from his work suffice to illustrate the imaginary positiveness with which the doctrine of transmigration was propounded, and to establish the conclusion that this doctrine rested in India on ethical grounds.

It has been already pointed out that the belief in the soul's life after the death of the body must precede the doctrine of transmigration. As such a belief, however, may be traced in some hymns of the *R'igveda* (see VEDA), it has been supposed that this doctrine, too, is as old as this Veda. But apart from the uncertainty which still exists regarding not only the age, but even the relative age at which the different hymns of the *R'igveda* were composed, and setting aside the fallacy which therefore attaches to speaking of this Veda as a contemporaneous whole, it is necessary to observe that the only passage which has been adduced in proof of this important discovery does not bear it out. It is the 32d verse of the hymn I. 164, and, according to the translation of Professor Wilson (vol. ii. pp. 137, 138), runs as follows: 'He who has made (this state of things) does not comprehend it: he who has beheld it, has it also verily hidden (from him); he, whilst yet enveloped in his mother's womb, is *subject to many births*, and has entered upon evil.' But the word of the text, *bahuprajâh'*, rendered by Wilson, according to the commentator, 'is subject to many births,' may, according to the same commentator, also mean, 'has many offsprings,' or 'has many children;' and as the latter sense is the more literal and usual sense of the word, whereas the former is artificial, no conclusion whatever regarding the doctrine of transmigration can safely be founded on it.

The Buddhistic belief in transmigration is derived from that of the Brahmanic Hindus; it agrees with

the latter in principle, though it differs from it in the imaginary detail in which it was worked out.

Like the Brahmanic Hindus, the Buddhists believe that all souls have existed from the beginning; like them, they believe in the unreality and sinfulness of the world, in the necessity of the soul's freeing itself from the bondage of this world, and in the casual connection between the actions of man in this, and his conditions in a subsequent life. Like the Brahmanic Hindus, they hold, therefore, that sin is the cause of transmigration, and that by a total expiation of sin, the soul ceases to be reborn, and attains its final resting-place. But since this resting-place is to the Buddhists Nirvâna (q. v.), or Non-entity, whereas to Brahmanism it is Brahman, or the principle of Entity; since they reject the institution of caste, which is the social foundation of Brahmanic life; since they do not acknowledge the authority of the Vedas, and the codes based on it, and therefore consider as morally wrong much that the Brahmanic 'Sâstras enjoin as morally right, the standard according to which the life of a Buddhist is regulated must differ in many respects from that which governs the conduct of a Brahmanic Hindu; and his ideas of reward and punishment, therefore, as reflected by his ideas of the mode of transmigration, likewise differ from those of the Brahmanic believer. To enlarge here on this difference is not necessary, for, after the illustrations already afforded from Manu, it is easy to conceive that the *detail* of the Buddhistic doctrine of transmigration is as fanciful as that of the Brahmanic doctrine; that it is therefore partly devoid of interest, and partly intelligible only if taken in connection with the detail of Buddhistic religion and literature (see BUDDHISM; also LAMAISM). Yet it is not superfluous to point out one great difference which separates the notions of one class of Buddhists from those of the rest, as well as from those of the Brahmanic Hindus. According to the latter, and the great mass of Buddhists, it is always the same soul which ever from its first birth reappears in its subsequent births, until it is finally liberated from transmigration. But among the southern Buddhists, another idea has also taken root. In their belief, the succession of existences of a being is also a succession of souls; and each such soul, though the result of its predecessor, is not identical with it. According to this view, the body dies, and with it the soul, too, is 'extinguished,' leaving behind only the good and bad acts which it has performed during its life. The result of these acts now becomes the seed of a new life, and the soul of this new life is therefore the necessary product of the soul of the former life. Thus all the succeeding souls have to labour at the solution of the same problem, which began when their first ancestor entered this world, but no succeeding birth is animated by the same soul. This dogma is illustrated in their works by various similes. One lamp, they say, for instance, is kindled at another; the light of the former is not identical with that of the latter, but nevertheless, without this, the other light could not have originated. Or, a tree produces fruit; from the fruit, another tree arises, and so on; the last tree is therefore not the same as the first, though the fruit is the necessary cause of the last.

In Greece, the doctrine of transmigration—or, as it is there called, *metempsychosis*—did not become the belief of the people, but was confined to the teaching of the mysteries and the tenets of philosophers, who probably derived it, either directly or indirectly, from Egypt or India. According to some, Thales (q. v.) was the first Greek philosopher who propounded it; according to others, Pherecydes (q. v.), the teacher of Pythagoras (q. v.); but its importance in Greek philosophy it first obtained through the system of Pythagoras, who, it seems, became acquainted with it through Egyptian sources. After him, it was Plato (q. v.) who assigned to it a prominent place in his philosophy; and he probably was indebted to Hindu writers for his views on metempsychosis, as explained in his dialogues, especially in *Phædros*. Plato's doctrine was refuted by Aristotle, but revived, though in a modified shape, by the Neo-Platonists.

Since a belief that the consequences of the acts of man must follow their inevitable course, and can neither be averted nor stopped by the intercession of a divine power, is incompatible with a belief in divine grace, the doctrine of transmigration or metempsychosis could never gain a firm ground in the religion of the Jews and Christians. It deserves notice, however, that in both these religions it found adherents as well in ancient as modern times. Amongst the Jews, the doctrine of transmigration—the *Gilgul Neshamoth*—was taught in the mystical system of the *Kabbala*, which pretends to divulge the secrets of creation and those of the nature of the divine and human soul. 'All the souls,' the *Sohar*, or the book of 'light,' the spiritual code of this system, says, 'are subject to the trials of transmigration; and men do not know which are the ways of the Most High in their regard. They do not know how they are judged in all times, as well before they come to this world as after they leave it. They do not know how many transformations and mysterious trials they must undergo: how many souls and spirits come to this world without returning to the palace of the divine king.' The principle, in short, of the Kabbala is the same as that of Brahmanism. The souls, like all other existences of this world, it teaches, must re-enter the absolute substance whence they have emerged. But to accomplish this end, they must develop all the perfections the germ of which is planted in them; and if they have not fulfilled this condition during one life, they must commence another, a third, and so forth, until they have acquired the condition which fits them for their re-union with God. On the ground of this doctrine, which was shared in by Rabbis of the highest renown, it was held, for instance, that the soul of Adam migrated into David, and will come into the Messiah; that the soul of Japhet is the same as that of Simeon, and the soul of Teran migrated into Job. Generally, it was supposed by writers of this school, the souls of men are reborn in men, and those of women in women; but also the reverse takes place, as in the case of Thamar, who had the soul of a man, and in that of Judah, whose soul was in part that of a woman. And because Ruth had the soul of Thamar, she could not bear children until God imparted to her sparks of a female soul. If the soul of a man, however, is reborn in a woman, such a migration is held by some to be a punishment for the committal of great sins, as when a man refuses to give alms, or to communicate to others his wisdom. And it is by way of punishment, too, that the soul of a Jew is reborn in a heathen, or in an animal—a clean or unclean beast, a bird, a fish—or even in an inanimate object. Of all these transmigrations, biblical instances are adduced—according to their mode of interpretation—in the writings of Rabbi Manasse ben Israel, Rabbi Naphtali, Rabbi Meyer ben Gabbai, Rabbi Ruben, in the Jalkut Khadash, and other works of a similar character. Modern Kabbalists—for instance, Isaac Loria—have imagined that divine grace sometimes assists a soul in

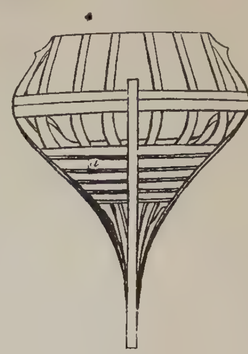
its career of expiation by allowing it to occupy the same body together with another soul, when both are to supplement each other, like the blind and the lame. Sometimes only one of these two souls requires a supplement of virtue, which it obtains from the other soul, better provided than its partner. The latter soul then becomes, as it were, the mother of the other soul, and bears it under her heart like a pregnant woman. Hence the name of gestation or impregnation is given to this strange association of two souls. That all these wild fancies have for their main object the explanation of obscure or mystical passages of the Bible, and the reconciliation of such as are or may seem contradictory, requires no remark; the philosopher, however, must look to their basis, which is purely ethical.

Among the early Christians, St Jerome relates the doctrine of transmigration was taught as a traditional and esoteric one, which was only communicated to a selected few; and Origenes, like the Kabbalists, considers it as the only means of explaining some biblical traditions, as that of the struggle of Jacob and Esau before their birth, or the selection of Jeremiah when he was not yet born, and many more events which would throw discredit on divine justice, unless they were justified by good or bad acts done in a former life. Of Christian sects, the Manichæans (q. v.) especially adhered to this belief, but the church always rejected it as a heresy.

In concluding, at least one great philosopher of modern times may here be named, as one whose views of the progress of mankind are based on the same doctrine; it is the celebrated German critic, G. E. Lessing, who endeavoured to establish it on metaphysical grounds. His arguments are briefly these: The soul is a simple being, capable of infinite conceptions. But being a finite being, it is not capable of such infinite conceptions at the same time; it must obtain them gradually in an infinite succession of time. If, however, it obtain them gradually, there must be an order in which, and a degree to which, these conceptions are acquired. This order and this measure are the senses. At present, the soul has of such senses five; but neither is there any ground to assume that it has commenced with having five senses, nor that it will stop there. For, since nature never takes a leap, the soul must have gone through all the lower stages before it arrived at that which it occupies now . . . . and since nature contains many substances and powers which are not accessible to those senses with which it is now endued, it must be assumed that there will be future stages, at which the soul will have as many senses as correspond with the powers of nature. And 'this my system,' he concludes his little but important essay, *Dass mehr als fünf Sinne für den Menschen sein können*—in a fragmentary note discovered after his death—'this my system is certainly the oldest of all philosophical systems; for it is in reality no other than the system of the pre-existence of the soul and metempsychosis, which did not only occupy the speculation of Pythagoras and Plato, but also before them of Egyptians, Chaldeans, and Persians—in short, of all the sages of the East; and this circumstance alone ought to work a good prejudice in its favour; for the first and oldest opinion is, in matters of speculation, always the most probable, because common sense immediately hit upon it.'

TRA'NSOM, a horizontal mullion or bar in a window, door, &c., chiefly used in late Gothic and Elizabethan architecture.

TRANSOMS, in Artillery, the bars or bolts by which the two sides—technically called 'cheeks'—of a gun-carriage are held together.—In a Ship, beams across the sternpost, at right angles to that timber



a, Transom.

fastened in the same way as the floors upon the keel.

TRA'NSPADANE REPUBLIC. See CISALPINE REPUBLIC.

TRANSPLA'NTING—the removal of a growing plant from one situation to another—is much practised with many kinds of cultivated plants, which are reared in a nursery, and *planted out*. Many flowers and culinary plants are generally treated in this way, as well as ornamental shrubs, and fruit and forest trees. It is desirable to have a ball of earth attached to the roots in every case, although this is often neglected. It is also desirable to shade the plant and water it for a few days after transplanting, when possible. Young plants are easily transplanted, as their roots, not having spread far, are raised from the ground without much injury, and this is the thing of first importance in the operation. At a more advanced age, transplanting becomes difficult, great part of the difficulty, however, being mechanical. No plant can be transplanted with safety when in flower or fruit; the plant may live, but the flowers or fruit will almost certainly perish. In like manner, leaves often wither; and transplanting ought, if possible, to be performed in winter, when vegetation is least active.

The transplanting of large trees, in order to immediate effect in the neighbourhood of a mansion, has been practised for many years with success. Notwithstanding all the care that can be taken, the trees are *thrown back* for two or three years; but this, in general, is all the injury which they sustain, unless removed from a situation very different from that in which they are placed. It is of great importance, in transplanting trees, that they should be placed in their new situation in the same direction to the prevailing wind as in their former situation. This is often disregarded, and many failures are the consequence. It ought also to be borne in mind, that trees taken from a thick wood, and planted in a lawn, or along the sides of an avenue, cannot be expected to succeed there. They have neither roots nor branches adapted to their new situation, and suffer from unaccustomed exposure to wind and weather. Trees of quick growth, such as limes and poplars, succeed most readily when transplanted; oaks are particularly difficult. In every case, however, there is much hazard, because the roots of trees generally spread far from the stem, and when the operation is unskilfully performed, the principal roots are often cut off, and the

smaller ones torn by the violence used, whilst all are injured by being laid bare. Trees thus treated seldom ever again assume a healthy appearance. The method is therefore now generally adopted of preparing the tree for transplanting by digging a trench around it, at least two years beforehand, at such distance as is thought expedient, cutting the roots all round, except two or three which are left to hold the tree fast, and then filling up the trench with fresh soil of the best quality that can be procured, into which a vast number of young roots are speedily thrown out. When the tree is to be removed, a new trench is made immediately on the outside of the former trench, and young roots sufficient for the nourishment of the tree are thus preserved. The ball of earth being generally too heavy for removal, is reduced in size by a very careful picking away of earth, so that the rootlets shall be as little as possible injured or even laid bare. The tree is generally transported to its new situation by attaching it firmly to a pole fixed upon an axle with a pair of wheels, the ball resting upon the axle. Good soil is put into the pit dug for it, and the roots are spread out. The tree is stayed by sticks and ropes till it is well established, and heavy stones are also laid on the top of the ball, or large beams of wood are laid across it, and firmly fastened to the ground at both ends. An improvement on this method has been effected by the use of a compost of vegetable mould, decayed leaves, &c. in preparing the tree for transplanting, not only in the trench dug around it, but on the top of the ball itself, so that the tree is encouraged to send out many new rootlets. A still greater improvement consists in the use of a machine by which a large ball of earth can be removed along with the tree, so that it is no longer necessary to pick away any part of the soil or to lay bare the young roots; whilst the tree being carried in a vertical instead of a horizontal position, all possibility of damage in this process is avoided. The machine used for this purpose consists of two pair of wheels, about 15 feet apart, each pair on a strong axle; the first pair smallest, and in a very large machine about 5½ feet in diameter; the second pair 7 feet. A strong frame rests on each axle to raise the horizontal bearers to a sufficient height. The front frame turns on a horizontal wheel, as in a carriage, for easy turning of the whole machine. Resting on the two frames are two strong horizontal beams of wood, above which are two short cross beams, with jack screws and strong chains for raising the tree. Beneath the roots and ball of earth, when the tree is raised from the ground, strong planks are placed, supported by chains from the beams. In order to raise the tree from its place, a sloped cutting is made, and the tree is drawn gradually up the inclined plane.

Transplanting Apparatus.

TRA'NSPORT, MILITARY AND NAVAL. Without a powerful system of transport, an army is helpless. To cross a sea, a large fleet of vessels properly fitted for men and horses, is requisite. When the English army, of about 30,000 men, crossed, in 1854, from Varna to the Crimea, it took 600 vessels to carry them, without any reserves of stores or food.

Not less important to the army moving by land is its transport. On entering battle, infantry and cavalry usually carry three days' rations with them, and 60 rounds of ammunition. The moment these are exhausted, they become dependent on the transport department for their replenishment. The first reserves are immediately in rear. To bring up supplies from these, and to keep these reserves themselves supplied, is the duty of the Military Train (q. v.) as regards food, and of the field-train in respect of ammunition. Between the grand dépôt and the base, the operation is generally intrusted to the wagons and beasts of the country, driven by natives, of course under proper military control. The amount of transport required by an army seems almost fabulous. The lowest computation must put one animal to four fighting-men. In addition to the transport of food and ammunition, the wounded and sick have to be carried, both from the field to the hospitals and during a march.

In the British army, the direction of the transport rests with the quartermaster-general: in the French army, it is under the *Intendant*, who is over all the administrative departments.

TRANSPORTA'TION, from the Latin for carrying across, means the removing of persons from one territory to another; and is thus distinguished from banishment, which is the mere driving of persons out of the country in which they live. Transportation, in this country, means a removal beyond seas, and has been in use to express the punishment of crime in that manner. The practice was known to the Romans; and transportation to Sicily will be found referred to in Cicero's charges against Verres. When the English monarchs had possessions on the continent, there was much jealousy about their carrying off troublesome persons to these dominions, and thus bringing them under irresponsible power. The legal transportation of criminals from the British dominions began early in the 17th c., when they were removed to the Plantations in America, and treated as slaves. This practice continued, under modifications, until it was stopped by the American revolution. Its unfitness as a punishment is obvious. The amount of infliction would depend, not on the extent of the criminal's guilt, but of his master's humanity. There were even worse evils; for young lads were kidnapped in Britain, and sold to the planters, and these victims were often unable to prove, even when they had an opportunity, that they were not legally transported for offences. When this method of getting rid of convicts ceased, there was great alarm that Britain would be overrun with crime, and it was hailed as a deliverance when the government resolved to establish a penal colony in Australia. The first convicts were conveyed thither in 1787. Such was the beginning of the famous colony of Sydney, or Botany Bay. Between the years 1820 and 1830, the system was at its full perfection; but though thousands were annually removed, crime did not appear to decrease. It was forgotten, that the predatory and fraudulent offences, which are by far the greater number in this country, are trade as well as crime; and that where there is a large

portion of the population, as there unfortunately is, prepared to have recourse to crime whenever it pays, the place of those removed is immediately supplied. When the criminals were sent to the antipodes, the mistake was made of supposing that they took the crime of the country with them, and that there was so much less need for precautionary measures at home. During twenty years, however, the greater proportion of the class of criminals who used to be transported, have been retained in this country, and liberated in it at the end of their punishment. This practice has been accompanied with two classes of precautionary measures—an improved police, and the reformation of juvenile delinquents. To these influences have been added free trade, and the consequence of all is, that crime is diminished to the extent of between a third and a half of what it was 20 years ago. In 1838, a committee of the House of Commons issued a celebrated Report on the effect of transportation. It was shewn to be still an extremely unequal punishment—in some instances giving rogues an opportunity of making their fortune, in other cases subjecting men less depraved, but more infirm in temper, to punishments of the most frightful kind. It was found to be accompanied by the prevalence of crimes which cannot be mentioned, and with a vast amount of general demoralisation in the convict settlements. Yet it was found not to have much terror for the criminal classes, who heard more about the success than the hardships of transportees. In 1840, transportation to New South Wales came to an end; and by a succession of statutes, sentences to penal servitude were substituted for sentences to transportation. Penal serfs can be transported, and a small colony of them is still continued in Western Australia. The practice of transportation cannot, it will be easily understood, be carried out by governments which have no colonies, though Russia manages it by possession of the desolate region of Siberia. It is a curious circumstance that the practice began in France just as Great Britain was abandoning it.—See CONVICT, PENAL SERVITUDE, PRISON DISCIPLINE, TICKET OF LEAVE.

TRANSPO'SE, in Music, is to change a piece of music in performance from the key in which it is written to another key. To play at sight an accompaniment for such an instrument as the pianoforte or organ, transposed from one key to another, requires considerable artistic skill. To the singer, transposal presents no difficulties.

TRANSUBSTANTIA'TION (Lat. *transubstantiatio*, change of substance, from *trans*, over, and *substantia*, a substance), a word used by the scholastic writers of the Roman Catholic Church to designate the change which is believed by Roman Catholics to take place in the Eucharistic elements of bread and wine, in virtue of the consecration. Under the head REAL PRESENCE (q. v.), which is often loosely comprehended under the larger name of transubstantiation, the doctrine of Catholics as to the presence of the body and blood of Christ in the Eucharist, after consecration, has been fully explained. There remains, however, beyond this doctrine as to the presence of Christ, a further inquiry concerning the elements of bread and wine which had existed in their natural condition before the consecration. For Sacramentarians (q. v.), this question is easily resolved. But those Protestants who hold in common with Catholics the reality of Christ's presence, differ from them as to the co-presence of the substance of bread and wine after consecration. Some Anglican divines, who hold the real presence of the body and blood, would appear to content themselves with remaining silent as to the mode of the presence. Dr Pusey goes so far as to say, that the dispute between Anglicans and Romanists is 'probably a dispute about words' (*Eirenicon*, p. 229). The Lutheran views as to the mode of the presence have been explained under the heads IMPANATION, REAL PRESENCE (q. v.). According to the Catholic doctrine, which has been explicitly defined as an article of faith (Council of Trent, Sess. xiii. Can. 2), 'the whole substance of the bread is changed into the body of Christ, and the whole substance of the wine into His blood, the species alone remaining.' What is the precise philosophical meaning of the word 'species,' called also 'accidents,' in this definition, is not declared; but in popular language it may be described as simply meaning the appearances, that is to say, those qualities or conditions of bread and wine which produce upon the senses the impression of the presence of bread and wine. It is not taught, however, that in the change called transubstantiation, the body and blood of Christ are formed out of the substance of the bread and wine, but that, in virtue of the Eucharistic consecration, the substance of bread and wine cease to exist, and that the body and blood of Christ take their place; nor that the body and blood of Christ become what the schoolmen call the 'subject' of the 'accidents' of the bread and wine, but merely that, by a miraculous suspension of the ordinary law, the senses still continue to receive from the Eucharistic elements all the same impressions which they had previously received from the bread and wine; viz., of colour, taste, smell, solidity, extension, figure, &c.

The history of the controversy regarding transubstantiation is sketched in the article LORD'S SUPPER. The objections to the doctrine have been chiefly drawn from the philosophical difficulties which are involved in it; and the defenders of it have, for the most part, contented themselves with resting on the proofs which they profess to draw from Scripture and tradition, and a general demonstration that the doctrine, although mysterious, does not involve any philosophical repugnance or impossibility, and that the philosophical arguments against it are at the least not conclusive. Some Catholic philosophers have even undertaken to demonstrate the possibility of transubstantiation by philosophical arguments; and it is especially remarkable that the celebrated Leibnitz (q. v.) has not only entered at great length, and in several portions of his works, into this philosophical discussion, but professes to prove, by strict philosophical principles—by the consideration of the properties of matter, of substance, of space, extension, and the like—that the essential principle of the body 'may exist in many places at the same time, nay, under far-distant and distinct species.'—Leibnitz's *Deutsche Schriften*, i. pp. 283, 284.

TRANSVAAL (*i. e.* 'across the Vaal'), until 1877 a republic of South Africa, but now a part of Cape Colony, includes the country north of the Vaal River, and on both slopes of the Cashan Mountains, into which the emigrant Boers retired after the annexation of the Orange River Free State, in 1848, to the British crown, and declared their independence in 1852. Its limits lie between lat. 22°—27° S. and long. 27°—31° E. The N. boundary is formed by the Oori or Limpopo River, here running nearly from west to east; its E. boundary by the continuation of the Drachenberg Mountains, separating it from the coast-region, inhabited by the Zulu Kaffirs; on the S., it has the Vaal River from its source, dividing it from the Free State Republic; while on the W., an undefined line separates it from the Betjuana tribes, still independent, living along the edge of the desert

region of the Kalihari. Thus, an area of not less than 70,000 sq. m. is more or less under the control of the emigrant Boers, who are not very scrupulous in their dealings with the poor native tribes who lived, or live still, in the country they now occupy. This region may be described in general terms as a vast plateau, sloping to the north, supported by the coast-line of mountains, which, presenting a bold mural buttress, or escarpment, to the low country at their feet, stretch away on their western flank into vast undulating plains. At right angles to the coast-range, another belt of very high lands, called the Magaliesberg, runs east and west forming a watershed between the river-system of the Vaal or Orange and Limpopo rivers. The southern face of this range also presents long and undulating plains, generally well watered and wooded, and abounding with large game. To the north, as we approach the basin of the Limpopo, many high parallel chains of hills are met with, through narrow *poorts* or openings in which flow the many streams which form, further to the north-west, the Limpopo or Oori River, which is supposed to enter the ocean as the Sabia, in lat. 20° 43′ S., long. 34° 30′ E. This point, however, is still one in dispute with African geographers. See SOFALA. The rivers of the Transvaal region are more generally applicable for irrigating purposes than those of the Free State or Cape Colony in general, their channels not lying so deep below the general surface of the country.

The average height of the plateau inhabited by the emigrant farmers of European descent is from 4000 to 5000 feet. Many of the peaks of the mountain-range traversing the plateau attain an elevation of 9000 or 10,000 feet, and are covered with snow some months in the year. The altitude of the coast-line of mountains is considered at from 6000 to 7000 feet above the low region at their feet.

The principal towns are—Mooiriverdorp, or Potscherfstroem, favourably situated on the Mooi River, about 20 miles north of the Vaal River, the seat of the local government; Rustenberg, a few miles north of the Magaliesberg and Zoutpansberg, the most remote village inhabited by men of European descent in South Africa, about 40 miles south of the Limpopo River.

The population consists of emigrant farmers, and a mixture of deserters and foreign refugees from the Cape Colony and Natal. Their number, as far as can be ascertained, is about 30.000 souls. Scattered through the country are numerous kraals of Betjuans, who live in a kind of servitude, if not actual slavery, amongst their white masters, to whom they have to supply labour whenever required. Education is at a very low ebb, and the majority of the Boers are prejudiced and narrow-minded to a lamentable degree; and to the want of proper educational and religious advantages must be attributed their treatment of Livingstone, and many other European missionaries and travellers in those regions; but they still preserve a strong religious feeling of a high Calvinistic tendency, and although otherwise illiterate, there are but few Boers who cannot read their Bible and hymn-book.

The system of government is republican, and resembles that of the Orange River Free State (q. v.). The president is elected by the people, and holds office for five years. The government is administered by two bodies—the executive council, of which the president is chairman, and the legislative council, which consists of three members, chosen from each of the twelve districts into which the country is divided. In 1873 the public debt was £60,000. The budget for the year ending 31st January, 1874, gives the revenue at £49,318, and the expenditure at £45,481.

The climate is generally healthy, although north of the Magaliesberg its tropical nature begins to manifest itself. Hot winds and violent thunderstorms prevail in the summer months. The fly *Tsetse*, whose bite is death to the bovine and equine species, abounds in many parts, and renders travelling with oxen and horses difficult. A considerable trade is carried on with Natal; and parties of Boers occasionally, in the winter season, venture as far as the Portuguese factories at Sofala, Inhambane, and Delagoa Bay, to barter ivory and bees-wax, sawn timber, &c., for gunpowder, lead, coffee, &c.

When Captain Harris visited this region about 1835, the number of the larger mammalia found by him was enormous; and even Gordon Cumming, who hunted over part of it many years subsequently, found them still numerous. But the elephant, rhinoceros, and giraffe have been of late years slowly receding into the densely-wooded country near the sea-coast; and the larger antelopes are fast migrating into the Kalihari and country to the north-west. Crocodiles are numerous in the rivers, and a large species of boa is found. The geology appears to present the same features as in a large portion of the Cape Colony and Natal, table-topped mountains, and the peculiarly sharp peaked hills called Spitzkoppen are numerous. In May 1870 the Vaal valley was the scene of great activity, thousands being attracted thereto by the extraordinary diamond-fields discovered on the banks of the Vaal.

Mooiriverdorp is by land 960 miles north-east of Cape Town, and Zoutpansberg is 1300, and about 250 miles north-west of Delagoa Bay.

TRANSYLVA'NIA (called by the Hungarians *Erdély-Orszag*—Walach, *Arjal*—'the woody and mountainous country;' by the Germans *Siebenbürgen*, 'seven castles,' from the seven forts built by the Saxons on their establishment in the country, and which forts became nuclei of the walled cities of Hermannstadt, Klausenburg, Kronstadt, Bistritz, Mediasch, Mühlenbach, and Schäsburg and by the Romans *Transylvania*, from its position *beyond* the forest range which stretches southwards from the Carpathians, and forms its western boundary) is the most easterly crownland of Austria, and is bounded on the N. by Hungary and Galicia, E. by Bukovina and Moldavia, S. by Wallachia, and W. by the Military Frontier, the Banat, and Hungary. It contains 21,107 Eng. sq. m., with a pop. (1869) of 2,109,107, of whom 1,200,400 were Wallachs and Eastern Roumains, 573,000 Magyars and Szeklers, 235,000 Germans, the rest being Sclaves, gipsies, Armenians, Jews, Italians, &c. Classed according to their religious professions, in 1857, 623,055 were Non-united Greeks, 551,994 Greek-Catholics and Armenians, 461,837 Protestants, 228,095 Roman Catholics, and 14,152 Jews. T. is an elevated plateau (its lowest parts being 530 feet above sea-level) of an irregular form, somewhat resembling a triangle of which the upper part has been irregularly removed, and is bounded partially on the north, and wholly on the east and south, by a high range of mountains—a continuation of the Carpathians—which sends out innumerable lateral ridges towards the centre of the country, and along the western frontier, so that T. is an almost perfect natural fortress. There are no plains except where a river-basin widens out; but the valleys are numerous and exceedingly picturesque. Almost the whole country is drained westwards into the Danube, by the Theiss and its feeders in the north, and by the Maros, a tributary of the Theiss, and its feeders, in the centre and south; the south-eastern corner is drained by the Aluta, or Alt, which, after a winding course, breaks through the southern bounding range near Hermannstadt; while a number of streamlets

worm their way through the eastern range, and join the Sereth. The climate is more healthy and temperate than that of Hungary, the mountain-chain along the southern frontier keeping off the hot winds. The soil is extremely fertile; but much arable land is still uncultivated. The valleys and hill-sides supply abundant pasturage for numerous herds of cattle and droves of horses; the cultivated districts yield good crops of maize, rye, barley, oats, all sorts of leguminous plants, tobacco, saffron, madder, hemp, and lint. The culture of fruits is extensively practised, and immense quantities of apricots, peaches, plums, apples, pears, and walnuts, are annually produced. The extensive forests, which cover nearly 5,300,000 acres of ground, contribute largely to the wealth of the country. The vine is extensively cultivated, and, in spite of the defective mode of preparation, the produce is excellent in quality. The mineral wealth of T. is great; gold is found more abundantly than silver, and silver than copper; yet there are few gold mines regularly worked, and a thorough investigation of the extent to which this valuable metal exists in the country, seems never to have been made. Iron is found in abundance at Torockzo, copper at Balan, lead at Rodna; the other minerals are mercury, manganese, antimony, sulphur, arsenic, vitriol, alum, marble, &c. Coal is not absent; but firewood is so abundant and cheap, that no other combustible has been sought for; and even the extensive tracts of peat have been allowed to lie undisturbed. Rock-salt is abundant. T. has almost no manufactures, and the commerce, owing to the isolation of the country, the want of enterprise of its inhabitants, and the absence of good roads, is far from bearing a fair proportion to the amount of the country's produce.

Of the various races which now inhabit T., the Wallachs, the earliest possessors, though by far most numerous, were till recently subordinated to the other races of T., but since the revolution of 1848—1849, have acquired a position in the country which, by all means, honest or dishonest, they are striving to improve; the Magyars entered as conquerors in the 10th c., and still constitute the nobility and gentry of the land; the Saxons were introduced in 1143 and 1247 from the Rhenish provinces of Lower Saxony, by Kings Geysa II. and Bela IV. of Hungary, and received special privileges and immunities to induce them to settle in the country, and improve the cultivation of the soil; and the Szeklers, or Szekhelyi, are believed to be the descendants of the once formidable Huns. The last three are the dominant races of T., and live apart from each other—the Magyars occupying the west and centre, the Saxons the south and north-east, and the Szeklers the south-east. The Magyars, Bulgarians, and Armenians speak the Magyar language as used in Hungary; the Saxons employ Low-German in speaking, and High-German in writing, but with a considerable mixture of Magyar in both; the Szeklers speak a Turanian dialect; and the Wallachs use their own language intermixed with corrupt Latin. T. is little noticed in history till the Christian era, when part of it was occupied by the warlike Dacians, soon after whom the Sarmatian tribes of the Jazyges and Carpi settled in it. The conquest of the Dacians by Trajan, however, did not include that of the other two peoples, who proved very troublesome to the Roman settlers along the Danube, till they were conquered by Diocletian, and the Carpi carried away to Pannonia and other districts. In the middle of the 4th c., the Goths overran the country, defeating the Sarmatians in a great battle on the Maros, in which the monarch and the chief of his nobility perished; and they in their turn were forced, in 375, to retire before the Huns and their confederates. The Gepidæ next took possession of T. till their almost complete extirpation, in 566, by the Lombards and Avars. It was conquered by the Hungarians about 1000, and was governed by Woivodes till 1526, when the death of the Hungarian monarch at Mohacs prepared the way for the union of the two countries under the Woivode, John Zapolya; but the war which thence arose with the Austrians caused their complete severance, and Zapolya's sway was, in 1535, confined to T., of which he became sovereign lord, under the protection of the Turks. T., on its conquest by the Hungarians, was only partially settled; the eastern part constituted a grazing-ground for wandering tribes who had migrated thither. The Saxons were summoned by the Hungarian monarchs to act as a counterpoise to the increasing power of the nobles; and from similar motives the Burzen land was given to the Teutonic Knights, but the arrogant bearing of those soldiers of the cross soon offended their titular lord, and they were forced to leave the country. The 'golden charter' of King Andrew II. (1224) secured a perfectly free political system to the Saxons, whose 'comes' or chief was, like the head of a clan, both judge and leader, and from whom the only appeal was to the king in person. The firm protection and generous treatment accorded to the Saxons by the Hungarian monarchs were rewarded by steadfast loyalty, and succour in men and money whenever required. During the rest of the 16th c., the country was distracted by the bitter strife between the Catholic party, who were supported by Austria, and the Protestant party, who were allied with the Turks; the latter party, headed successively by princes of the houses of Zapolya and Bathory, generally maintaining the superiority. The next chief of the Protestant party was the celebrated Botskay, whose successes against Austria extorted from the emperor an acknowledgment of the independence of T. in 1606. To him succeeded Bethlem Gabor, the determined foe of Catholicism and Austria, who did important service during the Thirty Years' War. Between his son and successor, Stephen, and Ragotski arose a contest for the crown, in which the latter prevailed; but on Ragotski's death, the civil war was resumed, till the complete rout of the Austrians by the Turks, under Kiupruli, placed the sceptre in the hands of Michael Abaffi, who reigned, till his death in 1690, as a vassal of the Porte. The Austrians now again possessed themselves of T., despite the heroic resistance of Ragotski; and though Tekeli (q. v.) succeeded for a brief period in rolling back the invaders, the peace of Carlovitz, in 1699, again put them in possession; and after the death of Michael Abaffi II., in 1713, T. was completely incorporated with Hungary. It was erected into a grand principality in 1765. During the insurrection in 1848, the Hungarians and Szeklers joined the insurgents, and forced T. to reunite with Hungary, despite the opposition of the Saxons; and the Wallachs, still little better than a horde of savages, were let loose over the land to burn, plunder, and murder indiscriminately; the prostration of the country being completed in the following year during the bloody conflicts which took place here between Bem and the Russian troops. In the same year, T. was again separated from its turbulent neighbour, and made a crown land; the portions of it which had, in 1835, been annexed to Hungary being restored, as well as the Transylvanian Military Frontier, in 1851.—For an interesting sketch of the social life, character, mental characteristics, and present condition of the various races of T., see *Transylvania, its Products and its People*, by Charles Boner (Lond. 1865).

TRAP or TRA'PPEAN ROCKS, an important section of the Igneous Rocks (q. v.), associated with Primary and Secondary strata, so called from the Swedish *trappa*, a stair, because these rocks, having resisted, from their greater hardness, the abrading influences which have destroyed the softer sedimentary strata, stand out like huge steps on the faces of the hills and mountains in some places where they occur. Unlike granite, the Trap Rocks are free from silica crystallising as a separate constituent of the rock; from the modern volcanic rocks the structural difference is very slight, consisting only of the manner in which the silicate of magnesia and lime, common to both, is crystallised—in the older rocks appearing as hornblende, while in the newer it exists as augite.

Trap Rocks are composed of felspar and hornblende, and the different varieties founded on the chemical composition of the mass depend on the relative proportion of these two minerals. When the felspar predominates, the rock belongs to the felspathic trap or felstone series; and when the hornblende is abundant, it is a hornblendic trap or greenstone. This latter series contains the best known Trappean Rocks. The dark hornblende preponderates, and gives to the rock a dull green colour, from which it derives its well-known name greenstone, a translation of the German *grünstein*. It has, however, been shewn by Delesse that many Trappean Rocks owe their colour to a dark variety of felspar which exists in them, and such rocks belong rather to the felspathic than to the hornblendic series. Some greenstones are very light green, others are so dark as to appear black, and all intermediate shades of colour occur. These rocks vary also very greatly in texture: in some, the crystals are sufficiently large to be detected with the naked eye; while others are so fine-grained and compact that it is difficult to resolve the separate crystals even with the help of a lens. Experiments have shewn that the size of the crystal in an igneous rock increases in proportion to the length of time during which the mass remains fluid, and so permits the continued crystalline segregation of its various ingredients. The vitreous trap and obsidian would accordingly represent a speedily cooled flow of liquid rock. In fine-grained basalt, the crystalline force has been slightly developed; while greenstones of different textures exhibit its more continued operations in proportion to the coarseness of their texture. The principal varieties of hornblendic trap are greenstone, whinstone, or trap proper. When the crystals are extremely minute, and there is a tendency in the rock to become columnar, it is a basalt. If the felspar is a soda-felspar, either albite or oligoclase, it is diorite. Euphotide, diallage rock, or gabbro, is a compound of Labrador felspar and diallage, a variety of hornblende; it is a coarse, or sometimes fine-grained rock, with a granitic or porphyritic aspect. Hypersthene rock, or hyperite, is made up of Labrador felspar and hypersthene, another variety of hornblende; it is also a granitic-looking rock, very tough, and of a grayish or greenish-black colour: it is very abundant in the Isle of Skye. Different varieties of hornblendic trap are based upon the structure of the rock, as well as upon its chemical composition. Trappean obsidian is not a common rock, but it is occasionally found. Porphyritic trap is more abundant; a very black variety has received the name of metaphyre. Amygdaloid is a trap with round or almond-shaped cavities, filled with agate, calcite, or other minerals, scattered through it. Trap tuff consists of fragments of scoriæ, volcanic dust, and pieces of other rocks, forming a coarse irregular mass, sometimes bound together by a calcareous cement.

The characteristic rock of the felspathic series is felstone, compact felspar, or petrosilex. It is a light-coloured, greenish, or bluish, very compact, homogeneous, and translucent rock, with a flinty-looking appearance. It forms a large proportion of the contemporary intruded Trap Rocks in the Silurian measures of Wales. Clinkstone, or phonolite, is a variety found in layers or slabs which give a metallic ring when struck with the hammer. Aphanite, or cornean, scarcely differs from true felstone, except that it is a more compact and tougher rock. Pitchstone, or retinite, is a vitreous felstone, less glassy than obsidian, and of a green colour and resinous lustre: a dyke thirty feet wide occurs on the eastern shores of the island of Arran, cutting through the sandstone rocks. When distinct crystals of one or more minerals are scattered through an earthy or compact base of felstone, a felspathic porphyry is formed. The ancient red porphyry of Egypt, known as *rosso antico*, belongs to this set of rocks; it consists of a red felspathic base, in which are disseminated rose-coloured crystals of oligoclase, with some plates of blackish hornblende and grains of oxidised iron-ore.

As true igneous rocks come up from below, there is always a connection of some kind between the ejected mass and the inferior source of supply, except when the ejected materials have been subsequently arranged by atmospheric or aqueous agency. Pipes and dykes form such connections, and they are generally associated with tabular masses which have either spread themselves over the surface, or inserted themselves between the beds of the sedimentary strata. When the materials have been mechanically arranged, the igneous rocks are contemporaneous with the deposits in which they occur; but in all cases where strata are cut through by dykes or pipes, or are covered by flows of liquid rock, the igneous rocks are newer than the sedimentary strata with which they are associated.

TRA'PA, a genus of plants, of the natural order *Haloragiaceæ* (q. v.), having a 4-parted calyx, a 4-petallous corolla, and a nut on which the altered calyx appears in the form of spines; the cotyledons very unequal in size. All the species are aquatic plants, with floating habit. *T. natans*, the WATER CALTROPS, is the only European species. It is found in ditches and ponds in the south of Europe, and is grown in ponds in Holland. The floating leaves are rhomboidal, toothed, and smooth; those under water are cut into capillary segments. The fruit has four spines; the kernels are large and almond-like. They are good to eat, either raw or roasted, and somewhat resemble chestnuts in taste. They are often used in soups. The French name is *Marron d'Eau* (Water Chestnut).—*T. bispinosa*, the SINGHARA NUT, affords a great part of the food of the inhabitants of Cashmere, and a tax laid upon it by Runjeet Singh yielded a large sum annually. —*T. bicornis* is much cultivated in China, where the cultivation of aquatic plants is carried on to a degree unknown in other parts of the world, and its fruit is much used for food. In both these species, the nut has only two spines.

TRAPA'NI (anc. *Drepanum*), one of the principal seaports of Sicily, on Cape Trapani, in the north-west of the island; capital of the province of that name, 40 miles west of Palermo. Pop. (1861) 26,334. The town is walled, and defended by a fortress. The streets are wide, and well paved with flagstones. There is a natural harbour, capable of admitting vessels of about 300 tons; a handsome town-house; a tower built by the Saracens; a cathedral; and many churches, some of which contain fine paintings. The inhabitants are engaged in the tunny,

anchovy, and coral fisheries. The coral is brought from the coast of Barbary to T. to be cut and polished for exportation. T. is a busy town, and exports sumach, salt, soda, coral, alabaster, wine, tunny, and anchovies.

Ancient *Drepanum* was probably founded by the Carthaginians, under whom it became an important stronghold. Here took place a celebrated naval engagement between the Romans, under P. Claudius, and the Carthaginians, under Adherbal, 249 B. C., in which the former were completely beaten. In Roman history, the name scarcely appears, but it seems to have flourished in obscurity both then and during the middle ages.

TRAPE'ZIUM (Gr. *trapezion*, a little table) is the general term for a four-sided plane figure, and is synonymous with 'quadrilateral.' But since all four-sided figures which have parallel sides possess distinctive appellations, the term trapezium is frequently restricted to quadrilaterals whose sides are not parallel. The trapezium, in the restricted sense (exclusive of parallelograms), has some remarkable properties: thus, if its sides be bisected, and the adjacent points of bisection joined, the resulting four-sided figure is a parallelogram; the sum of the squares of its diagonals is equal to the sum of the squares of the sides, together with four times the square of the line joining the middle points of the diagonals; if it can be inscribed in a circle (i. e., if its four corners are in the circumference of any circle), the one pair of opposite angles is equal to the other pair, and the sum of the rectangles by each pair of opposite sides is equal to the rectangle by the diagonals; if it can be described about a circle (i. e., if a circle can be made to touch on the interior, each of the four sides), the one pair of opposite sides is equal to the other pair.

TRA'PEZOID, a plane quadrilateral which has two of its sides parallel, and the other two not.

TRA'PPIST ORDER, THE, celebrated among the religious orders of the Roman Catholic Church for its extraordinary austerities, is so called from La Trappe, an abbey of the Cistercian order, founded in the middle of the 12th century. The discipline of this monastery, in common with many others of the more wealthy monastic bodies, especially of those which, by one of the corruptions of the period, were held *in commendam*, had become very much relaxed; and in the 17th c. but little trace of the ancient religious observance remained. In the first half of that century, the abbey of La Trappe fell, with other ecclesiastical preferments, to the celebrated Armand Jean le Bouthelier de Rancé. The circumstances which led this remarkable man to undertake a reform of his monastery, and in the end the establishment of what was equivalent to a new religious order, have been already detailed in the article Rancé (q. v.). It was in the year 1662 that he entered in earnest upon his duties, and commenced his reforms. At first, he encountered decided, and even violent opposition from the brethren; but his firmness and vigour overcame it all. He himself, as an evidence of a complete change of life, entered upon a fresh novitiate in the year 1663; and in the following year, made anew the solemn profession, and was reinstalled as abbot. From this time may be dated the introduction of the new austerities which have characterized the order. The monks were forbidden the use of meat, fish, wine, and eggs. All intercourse with externs was cut off, and the old monastic habit of manual labour was revived. The reform of De Rancé is founded on the principle of perpetual prayer and entire self-abnegation. By the Trappist rule, the monks are obliged to rise at two o'clock A. M. for matins in the church, which lasts till half-past three; and after an interval occupied in private devotion, they go at half-past five to the office of prime, which is followed by a lecture. At seven, they engage in their several daily tasks, indoors or out, according to the weather. At half after nine, they return to the choir, for the successive offices of terce, sext, and none; at the close of which they dine on vegetables dressed without butter or oil, and a little fruit. This meal is succeeded by manual labour for two hours, after which each monk occupies an hour in private prayer or reading in his own cell until four o'clock, when they again assemble in the choir for vespers. The supper consists of bread and water, and after a short interval of repose, is followed by a lecture. At six o'clock they recite complin in choir, and at the end, spend half an hour in meditation, retiring to rest at eight o'clock. The bed is a hard straw mattress, with a coarse coverlet; and the Trappist never lays aside his habit, even in case of sickness, unless it should prove extreme. Perpetual silence is prescribed, unless in cases of necessity. The minor practices and observances are devised so as to remind the monk at every turn of the shortness of life and the rigour of judgment; and the last scene of life is made signal in its austerity by the dying man being laid during his death-agony upon a few handfuls of straw, that he may, as it were, lay aside upon the very brink of the grave even the last fragment of earthly comfort to which the necessities of nature had till then compelled him to cling.

The reformed order of La Trappe scarcely extended beyond France in the first period of its institution. The inmates of La Trappe shared, at the Revolution, the common fate of all the religious houses of France: they were compelled to quit their monastery; but a considerable number of them found a shelter at Valsainte, in the canton of Freiburg in Switzerland. In the vicissitudes of the revolutionary war, they were driven from this house; and a community numbering about 250, together with a large number of nuns, who had been established for purposes of education, found refuge at Constance, at Augsburg, at Munich, and eventually, under the Czar Paul, in Lithuania and White Russia. Later in the course of the war, small communities obtained a certain footing in Italy, Spain, America, England, and, notwithstanding the prohibitory law, even in France, at Mont Genevre. After the Restoration, they resumed, by purchase, possession of their old home at La Trappe, which continues up to the present time to be the head monastery of the order, and numbers nearly 200 members. During the course of the last 45 years, they have formed many establishments in France; a few in Germany; a very considerable one at Mount Melleray, near Cappoquin, in the county of Waterford, Ireland; and others with still more extensive territory annexed in Kentucky, Illinois, and other states of North America. A modification of the T. O., called 'Trappist Preachers,' was established about 25 years since, at Pierre-qui-Bire, near Avallon.—See Gaillardin's *Trappistes; ou l'Ordre de Citeaux au* 19 *Siècle* (Paris, 1844).

TRASH. See SUGAR.

TRASIME'NUS LACUS, the ancient name of an Italian lake (*Lago Trasimeno*, or *Lago di Perugia*) lying between the towns of Cortona and Perugia. It is about ten miles in length by 8 in breadth; the greatest depth is not above 30 feet. The lake has no apparent outlet, and the margins are flat and overgrown with reeds. It is surrounded on all sides by hills, those on the north side, extending

from Cortona to the lake, being known as the Gualandro Hills—the *Montes Cortonenses* of Livy—covered at the present day with oak, vine, and olive plantations. The lake contains three islands. T. L. is memorable chiefly for the great victory obtained by Hannibal in 217 B.C. during the Second Punic War, over the Romans, under their consul, C. Flaminius. Hannibal leaving Fæsulæ, passed close by the camp of Flaminius at Arretium, laying waste the country as he proceeded in the direction of Rome. This, as the Carthaginian general intended, induced the consul to break up his encampment, and follow in pursuit, Hannibal in the meantime taking up a strong position on the hills on the north side of the lake, along which he was passing. The consul, coming up early next morning, when the whole place was enveloped in mist, saw only the troops in front on the hill of *Tuoro*, with whom he was preparing to engage, when he found himself surrounded and attacked on all sides. The Carthaginians thus had the Romans completely in their power, and took such advantage of the opportunity, that 16,000 Roman troops are said to have been either massacred or drowned in the lake, Flaminius himself being among the first who fell: 6000 troops who had forced their way through the enemy, surrendered next day to Maharbal. It is said both by Livy and Pliny that the fury on both sides was so great as to render the combatants unconscious of the shock of an earthquake which occurred during the battle.

TRAS-OS-MO'NTÉS (Beyond the Mountains), a province of Portugal, forming the north-east corner of the country, is bounded on the N. and E. by Spain, on the S. by the river Douro, and on the W. by the Portuguese province of Minho. Area, 3980 sq. m.; pop. (1878) 410,461. It is in the main a cold plateau, with bare mountain masses, broken through by deep romantic ravines; but the port-wine district, known as the *Alto-Douro*, is very pleasant. Considerable quantities of wheat and rye are raised, but the chief products are wine and oil. In several places, the silkworm cultivation is prosecuted with success. Fruits, especially oranges, are produced abundantly in the valleys, and sumach on the mountains, which are also rich in unutilised metallic wealth.

TRASS, a tufaceous deposit of the extinct volcanoes of the Eifel, near Coblenz, resembling the Puzzolana of Naples. Its base consists almost entirely of pumice, in which are embedded fragments of basalt, burnt shale, slate, sandstone, &c., and even numerous trunks and branches of trees. Its formation is accounted for by supposing an eruption to have taken place, with copious evolution of gases, in a lake-basin, and a flood of the mud thus formed to have swept away whatever came before it. Large areas are covered by the T., which has choked up valleys, now partially re-excavated.

TRAVANCO'RE, a protected state in the extreme south of India, bounded on the E. by the states of Tinnevelli and Madura, and on the W. by the Indian Ocean. Area, 4722 sq. m.; pop. 1,011,824. At the southern extremity of the state is Cape Comorin (properly, Kumarin). On the elevations, the soil is light and gravelly; in the valleys, it is in general a deep black mould. Rice, the sago-palm, and vegetables are the principal products. Formerly, the capital was Travancore, a decayed and unimportant town; the present capital is the small town Trivanderam.

TRAVELLERS, LAW AS TO. In the United Kingdom, entire freedom of travelling is one of the rights of the subject. The rights of travellers in regard to the use of roads are stated under the head of Highway (q. v.). Other rights are noticed in connection with Inn (q. v.). With regard to travellers by conveyances, whether by land or sea, if the party conveying is a public carrier, then the following are his liabilities. A public carrier having a stage-coach (and railway companies are on the same footing) does not engage or warrant to convey a traveller with absolute safety, as is the case with respect to goods, but merely to convey without negligence on his part; hence, if the conveyance meets with some accident, resulting in injury to the traveller, the right of the latter to recover damages depends on whether the carrier or railway company has been guilty of negligence. Considering that, in case of a dispute, it is always left to a jury to say whether there was negligence or not, it is a safe maxim, that there is scarcely anything in the form of an accident which is not resolvable by a jury into negligence on the part of the carrier or company; and an injured traveller has seldom much difficulty in throwing the burden on the carrier of proving that there was no negligence on his part, and this proof, for the reasons stated, is seldom successful, at least where the accident arose from a defect in guiding the carriage. In case of accidents not fatal, the party injured has almost always a remedy against the carrier, the chief dispute being as to the amount of damages, the amount legally demandable varying according to the position in life and injury to business caused by the accident. In case of death caused by blamable accident in travelling, there was formerly no remedy available to the executors or relatives, and there is none at the present day; but if the deceased party leave a wife, husband, parent, or child, then these, but no other relations, can sue for damages. In the case of a traveller's proceeding a great distance over several lines of railway, his remedy is entirely against the company with whom he contracted—that is to say, to whom he paid the lump sum, and from whom he obtained his ticket. A carrier may contract not merely to carry a traveller a certain distance by his own conveyance, but to carry him to any part of the world, using for that purpose various other intermediate railways or steamers for the rest of the journey; and in all such cases the only person with whom the traveller contracts is the carrier to whom he paid his fare, who is liable for any accident or negligence, whether occurring on his own part of the line, or on any other part.—As to travellers' luggage, see LUGGAGE.

TRAVELLER'S TREE, or RAVENALA (*Urania speciosa*, or *Ravenala Madagascariensis*), a remarkable plant of the natural order *Musaceæ*, a native of Madagascar, and forming a characteristic feature of the scenery of many parts of that island. The stem resembles that of the plantain, but sends out leaves only on two opposite sides, like a great expanded fan. The lower leaves drop off as the stem grows, and in an old tree the lowest leaves are sometimes thirty feet from the ground. A tree often has twenty or twenty-four leaves, the stalk of each leaf being six or eight feet long, and the blade four or six feet more. The blade of the leaf is oblong, bright green, and shining. The fruit is not succulent, but is filled with a fine silky fibre of the most brilliant blue or purple colour, amongst which are about thirty or forty seeds. Forty or fifty fruits grow in a bunch, and three or four bunches may be seen at once on the tree. The leaves are much used for thatch, and for many other purposes; and the leaf-stalks for the partitions, and often even for the walls of houses. The leaf-stalks always contain water, even in the driest

weather, more than a quart being readily obtained by piercing the thick part of the base of a leaf-

Traveller's Tree (*Urania speciosa*).

stalk, and this water is pure and pleasant. Hence the name *Traveller's Tree.*

TRA'VEMÜNDE. See LÜBECK.

TRA'VERSE, in Fortification, mounds of earth, above the height of a man, and 18 feet thick, placed at frequent intervals on a rampart, to stop shot which may enfilade the face of such rampart. A fire of this nature, in the absence of traverses, would dismount the guns, and prove altogether ruinous. The traverses also give means of disputing the progress of an assailant who has gained a footing on the wall, for each traverse becomes a defensible parapet, only to be taken by storm.

TRAVERSE, in the Law of England, means the denial of fact given by one party in an action to the pleading of his adversary.

TRAVERSING PLATFORM, an arrangement for the more rapid and easy movement of cannon in battery. The gun is either mounted on an ordinary truck-carriage, or on rollers under its trunnions. The truck or rollers work in and out on two parallel iron rails, which rails are mounted on the traversing carriage, and are 16 feet or more in length. Wheels at each end of this platform, or more frequently if the weight of the gun be very great, are placed at right angles to the direction of the rails, and run on circular tramways, which have their centre in the embrasure through which the gun is fired. The rails incline upwards towards the rear, to moderate the gun's recoil. The advantages are, that the leverage for turning the gun is increased by the platform's length, while the circular rails diminish the resistance; that the gun is easily run out for firing on the upper rails; that by its own recoil it runs itself in again for loading; and that a much smaller embrasure is required to give a good compass to the muzzle.

TRA'VERTIN, the Italian name for limestone formed by springs holding lime in solution.

TRA'VESTY (Fr. *travestir*, to disguise, particularly through the effect of *contrast;* e. g., to dress in another sex's or person's clothes; Ital. *travestire*) is a term applied in literature to denote a burlesque representation of something previously executed in a serious and lofty manner. It differs from Parody (q. v.) in this respect, that while the latter changes the subject-matter and the *dramatis personæ*, but mockingly imitates the style of the original, the former leaves the subject-matter partially, and the *dramatis personæ* wholly, unaltered; producing a purely comic effect by the substitution of the mean, the frivolous, and the grotesque in action or speech, for the serious, the noble, or the heroic.

TRAVNI'K, a town of European Turkey, capital of the province of Bosnia, on the Lasva River, 45 miles west-north-west of Bosna-Serai. Its numerous mosques and the castle, which dates from the middle ages, are the principal edifices. It contains 12,000 inhabitants, almost all Mohammedans. The principal branch of industry is the manufacture of sword-blades.

TRAW'LING, a mode of fishing by a net dragged along the bottom of the sea, behind a boat. It is much employed in deep-sea fishing on the coast of England, and by far the greater part of the fresh fish brought to the London market, herring and mackerel excepted, is now obtained by trawling. Trawling has long been practised on some parts of the south coast of England, but of late years this mode of fishing has been adopted much more extensively than before, and has been introduced where it was formerly unknown, particularly on the east coast of England, not without great opposition on the part of line-fishers and others, who have loudly complained of injury done by it to the fisheries by destruction of spawn, and otherwise. The Report of the Commissioners on the Sea-fisheries of the United Kingdom, 1866, sets aside all complaints against it, however, as unfounded; whilst its great productiveness recommends it as advantageous to the public interest. The *Trawl*, or *Beam-trawl*, as

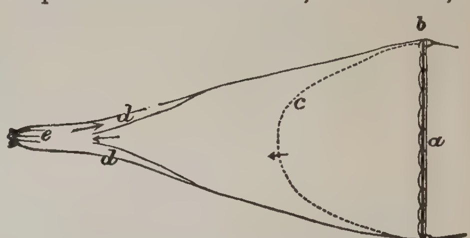


Fig. 1.—Beam-trawl Net:
a, beam; *b*, *b*, trawl-heads; *c*, outline of the ground rope; *d*, *d*, the pockets; *e*, the cod or small end of the net.

it is often called, is a triangular purse-shaped net, about 70 feet long, usually having a breadth of about 40 feet at the mouth, and gradually diminishing to 4 or 5 feet at the commencement of the *cod*, or smaller end of the net, which is about 10 feet long, and of nearly uniform breadth. The upper part of the mouth is secured to a wooden beam about 40 feet long, which keeps the net open; this beam is supported on two upright iron frames, known as the *trawl-heads* or *irons*. The under side of the net corresponds with the upper, except that instead of being fastened to a beam, it is made with a deeply-curved margin attached to the *ground-rope*, the whole length of it in contact with the ground. A trawl has also generally two *pockets*, one on each side, made by lacing together the upper and under parts, so that fish turning back from the cod may be caught in them. The meshes vary in size from four inches square at the mouth, to an inch and a quarter square in the cod. Two stout ropes, of about 15 fathoms each, are fastened, one to the front

of each of the trawl-heads, the other ends united to form a bridle, to which is shackled a warp 150 fathoms long. By this warp the trawl is towed, the quantity of rope paid out depending on depth of water, weather, and other conditions. Trawling is generally in the direction of the tide, sometimes across it, but never against it. The rate of progress is usually only from half a mile to two miles an hour faster than that of the stream. The trawl can only be used with advantage on a sandy bottom or other smooth ground. On rough ground, the net would be torn in pieces. The vessels employed in trawling on the Dogger Bank and elsewhere near the English coast vary in size from 35 to 60 tons. Many of these trawlers, however, stay out at sea for six weeks at a time in all seasons of the year; their fish being packed in ice collected by fast-sailing cutters, and so conveyed to market. Cod, haddock, and other *white-fish* are caught in great numbers by trawling; and some kinds of flat-fish, as soles, are scarcely to be obtained by any other means. Smaller trawl-nets than those above described are used in bays and estuaries. A kind of trawl called the *pole-trawl* was formerly in use

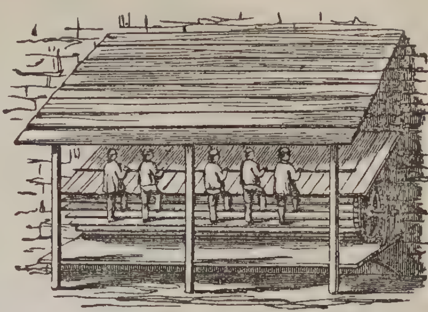
Fig. 2.—Pole-trawl Net.

in some parts of England, but is now used only in the south of Ireland. It is much less effective than the beam-trawl. Instead of a beam, two poles of 25—30 feet long are used, rigged out on the sides of the vessel, to keep the mouth of the net open.

The term trawling is commonly, although incorrectly, employed in Scotland to designate a particular mode of herring-fishing, which, however, is only seine-net fishing (see NETS) on the principle of encircling shoals of fish, as has been practised in pilchard-fishing on the south coast of England from time immemorial. It is of recent introduction in Scotland, and has been opposed by the drift-net herring-fishers, from interested motives, in the same way that beam-trawling has been opposed on many parts of the English coast. The legislature too hastily accepted the views of its opponents; but a Royal Commission having been appointed to inquire into the subject, made a report decidedly favourable to it in 1863; and the judgment of that Commission is sustained by the Report of the Sea-fisheries Commission of the United Kingdom in 1866.

TREACLE. See SUGAR.

TREAD-MILL, an appliance of prison discipline, much in use some years ago in the prisons of Great Britain, the invention of Sir William Cubit, of Ipswich. It consists of a wheel in the form of a long cylinder, furnished with 24 steps round its circumference, and turned on its axis by the tread of prisoners, each of whom may be made to tread in a separate compartment, so boarded off that he can have no intercourse with the rest. The prisoners are assisted and supported by a hand-rail, and cause the wheel to revolve about twice in the minute. The tread-mill has sometimes been made productive by being used to grind corn or turn machinery. It has been found an objection to its use, that it does not admit of being modified to meet the varying strength of individual prisoners; and as an instrument of prison discipline, it has been generally supplanted by the *Crank*, a small flaked wheel, like the paddle-wheel of a steamer, which, on the prisoner turning a handle outside, revolves within a box partially filled with gravel. The amount of strength necessary to each revolution can be regulated by the quantity of



Tread-mill.

gravel used, and a register placed outside the prisoner's cell records the number of revolutions made. The crank is only used when hard-labour is part of the prisoner's sentence.

TREASON (Fr. *trahison*, Lat. *traditio*, from *tradere*, to give up or betray), in the Law of the United Kingdom, is the highest civil crime which a member of the community can commit, being treachery against the sovereign. By the ancient common law of England, there was great latitude as to what was held by the judges to be treason, whereby, says Blackstone (b. iv. c. vi.), the creatures of tyrannical princes had opportunity to create abundance of constructive treasons, that is, to raise, by forced and arbitrary constructions, offences into the crime and punishment of treason, which never were suspected to be such. Thus, the accroaching, or attempting to exercise royal power—a very uncertain charge—has been treated as treason; and killing the king's father or brother, or even his messenger, has also been so treated. The inconvenience of these constructive treasons led to the passing of the statute of 25 Ed. III. c. 2, which attempted to define treason, and it was defined in five forms. 1. When a man compasses or imagines the death of the king, queen, or their eldest son and heir. Under this clause it was held that the husband of a queen-regnant was not included; but it includes a king *de facto*, without regard to his title. The phrase 'compassing and imagining the death of a king,' has given rise to much discussion, but it has been taken to mean the mere purpose or design, as distinguished from the carrying such design into effect; nevertheless, the purpose can only be proved by some overt acts, such as providing weapons or ammunition for the purpose of killing the king, assembling and consulting on the means to kill the king, &c. The law has often, however, been strained, and in arbitrary reigns, even a sermon unpreached was held to convict Peachum; and a paper found in a closet, to convict Algernon Sidney, though merely speculative in its character. 2. Another form of treason is the violating of the king's companion (i. e., wife), or his eldest daughter unmarried, or the wife of the king's eldest son and heir. 3. Another form is that of levying war against the king in his realm, either by taking arms to dethrone the king, or under pretence to reform religion or the laws; by resisting the king's forces; by joining an insurrection, with an avowed design to pull down all enclosures, all brothels, and the like; though such a conspiracy, if aimed at a particular house, would be only a riot. 4. It is also treason to adhere to the king's enemies in the realm by giving them aid and comfort, as by sending

intelligence or provisions, or selling arms. 5. Lastly, it is treason to slay the chancellor, treasurer, or the king's justices of the bench, or in assize, while in their places administering justice. Besides these specific forms of treason, the statute of Edward III. enacted that, if there should be other cases not above specified, the judge should tarry without going to judgment, till the king and parliament should judge it treason or other felony—which was a safeguard against the judges indulging too much in refinements about constructive treason. At a later period, between the reigns of Henry IV. and Queen Mary, the courts returned to the system of inventing constructive treasons, and actually included as such the clipping of money, burning houses to extort money, refusing to abjure the pope, &c. These and other new-fangled treasons were totally abolished by a statute of 1 Ed. VI. c. 12. By a subsequent statute of 1 Anne c. 17, whoever endeavours to hinder the next in the succession under the Act of Settlement, from succeeding to the crown, is to be held guilty of treason; and whoever maliciously affirms another to have right to the crown, otherwise than according to the Act of Settlement, commits treason. Moreover, by 36 Geo. III. c. 7, whoever compasses or intends death or bodily harm to the person of the king, is to be adjudged a traitor. The prisoner is entitled to a copy of the indictment, a list of the witnesses, and counsel for his defense. This right, which prisoners accused of other crimes have not in English law, was conferred by a statute of Will. III.

The punishment of treason is severe and even revolting. The traitor is to be drawn on a hurdle to the place of execution, hanged by the neck, his head then severed from the body, the body divided into four quarters; and the head and quarters to be at the disposal of the crown. But the king may, after sentence, by warrant, change the sentence into beheading. In the case of women, they are only to be hanged. The consequence of a conviction of treason is forfeiture and corruption of blood. The forfeiture affects all the lands and freehold estates, and relates back to the time of the treason committed. The corruption of blood which also ensues has this effect, that an attainted person can neither inherit lands from his ancestor, nor transmit them by descent to any heir, but they escheat to the lord of the fee, subject to the crown's superior right of forfeiture. Not only are the lands forfeited, but the goods and chattels also of the prisoner.

There are certain minor offences which are called misprision of treason, being those closely bordering on treason. Such are offences which consist in the bare knowledge and concealment of treason, without any degree of assent thereto, for any assent makes the party a principal traitor. If a person, knowing of the treason, do not forthwith reveal it to some judge of assize or justice of the peace, this is the crime of misprision of treason. The punishment of misprision of treason is loss of goods and lands during life. Another offence closely related to treason is the wilfully pointing a gun at, or attempting to strike, the person of the sovereign, with intent to injure him (or her); the offence being recently reduced, by statute 5 and 6 Vict. c. 51, to one punishable with three years' imprisonment. There is also a cognate offence created by 11 and 12 Vict. c. 12—that of intending to depose the queen, or levying war against her in order to intimidate her or the Houses of Parliament. The offence of Præmunire (q. v.) was originally the introducing a foreign power into the country, and the name was extended to similar offences. The law of treason in England and Scotland is the same.

The Constitution of the United States defines treason to consist only in levying war against them, in adhering to their enemies, giving them aid or comfort, and is punished with death. No person can be convicted of treason except on the testimony of two witnesses to the same overt act, or on confession in open court.

TREA'SURER, Lord High, the name given to the third great officer of the crown in England, who, in former times, was sole head of the king's exchequer. In the reign of William I. a separate board and court for matters of revenue was appointed after the model of the Exchequer of Normandy, and a treasurer and other officers were appointed for transacting business relating to the royal revenue. Odo, Earl of Kent, was the earliest holder of this office; but the early treasurers were for the most part churchmen. The functions of the treasurer were often discharged by the Chief Justiciary, and the offices of Justiciary and Treasurer seem not to have been completely separated till the reign of Stephen. The office of Lord High Treasurer was for the first time put into commission by James I. in 1612; and from the accession of George I. down to the present time, it has been the practice to vest the office in a Board of Lords Commissioners of the Treasury. See Treasury. In Scotland, a similar office existed prior to the Union; and there were also Lords High Treasurers appointed in Ireland. In 1816, by statute 56 Geo. III. c. 98, on the consolidation of the same offices in England and Ireland, he was constituted the Lord High Treasurer of the United Kingdom.

TREASURER OF THE UNITED STATES is an officer in the Treasury Department, who receives and keeps the moneys of the United States in his office and that of the depositaries, and pays out the same on warrants drawn by the Secretary of the Treasury, countersigned by the First Comptroller, and upon warrants drawn by the Postmaster-General, and countersigned by the Sixth Auditor, and recorded by the Register. He also holds public moneys advanced by warrant to disbursing officers, and pays out the same upon their checks.

TREASURE-TROVE is the finding of hidden treasure in the earth; the word treasure meaning coin, gold or silver plate, or bullion. By the law of England, he who finds such things hidden in the earth is not entitled to them, but they belong to the crown. This is an exception to the general rule, that he who first finds a thing, whose owner is unknown, is entitled to keep it; and accordingly the exception is construed strictly, so that if the coin, &c., is not hidden in and covered by the earth, the finder, and not the crown, is entitled to it. If it is treasure-trove in the strict sense above described, then it is the duty of the finder to give notice to the crown; and to conceal it or appropriate it is an indictable offence, punishable by fine and imprisonment.—In Scotland, the rule is the same, and the finder is bound to inform the sheriff of the finding. It is not so generally known as it ought to be that the crown is in the practice of paying to the finder the value of the property, on its being delivered up; from misapprehension of this matter it is believed that many curious relics are lost by their finders consigning them to the melting-pot.

TREASURY, that department of the executive of the government of the United Kingdom which has the control of the revenue and expenditure of the country. The head of the Treasury was in former times an officer called the Lord High Treasurer (see Treasurer, Lord High), but his office has ever since the accession of George I. been executed by Lords Commissioners, who have become his permanent representatives. The Treasury Board

now consists of the Prime Minister (generally styled First Lord of the Treasury), the Chancellor of the Exchequer, and three junior Lords of the Treasury, who have usually seats in parliament, as have also the two joint-secretaries of the Treasury. The First Lord being the head of the administration, his duties are not limited to the Treasury, which is chiefly conducted by the other members of the Board. The Chancellor of the Exchequer, who holds under a distinct patent the office of Under-treasurer, is the effective head of the Treasury, exercising the most responsible control over the expenditure of the different branches of the service, as also over all works demanding unusual outlay in the naval, military, and civil departments, either at home or in the colonies. He prepares an annual estimate of the expenses of the country, and of the ways and means by which they are proposed to be met; and this statement, known as the Budget, is submitted by him to the House of Commons. The Prime Minister, when a member of the House of Commons, has occasionally held at the same time the office of Chancellor of the Exchequer. The duties of the junior Lords are in a great measure formal: the heaviest portion of the executive functions of the Treasury devolves on the Secretaries.

The function of payment has ever since the Restoration been completely separated from the custody of the public revenue, the former only being vested in the Treasury, while the latter belongs to the Exchequer. By an arrangement effected by 4 and 5 Will. IV. c. 15, the revenue flowing into the Treasury is paid into the Bank of England, to the credit of the Comptroller-general of the Exchequer, and all payments on the public account are made pursuant to a warrant or order of the Treasury. No moneys voted by parliament can be drawn from the Exchequer without the warrant of the Treasury Board, nor can any payment be made from the civil list without its authority.

The duties of the Treasury Board are numerous. The supplies for the army, navy, and civil service are issued under its authority. In virtue of various statutes, it has the regulation of the salaries of newly created officers in other departments, and of the number of officers in the establishments for new branches of the public service. The duties of the Treasury also comprise the examination of the expenses of legal establishments, sheriffs, county courts, and criminal prosecutions. All payments for civil salaries, allowances, and incidental charges payable in England, and all payments for the army, navy, and ordnance, are made upon the special authority of the Treasury by the Paymaster-general. The Boards of Customs and Inland Revenue, and the Post-office, are subject to its general authority. The office of Woods and Forests now discharges many of the duties which formerly devolved on the Treasury, but is subject to its regulations. The establishments of colonial and other offices are also subject to the control of the Treasury with regard to their expenses. The Treasury may be appealed to against the decisions of subordinate departments in all cases connected with the receipt of revenue. The Treasury possesses the patronage of the departments immediately subordinate to it. The church patronage of the crown—except that which belongs to the Lord Chancellor—is usually disposed of on the advice of the First Lord of the Treasury; and the Foreign and Colonial Secretaries, in all important appointments falling under their patronage, are in the practice of consulting the First Lord of the Treasury.

TREATY, in Public Law, an agreement of friendship, alliance, commerce, or navigation, entered into between two or more independent states. Treaties have been divided by publicists into *personal* and *real*, the difference being that the former relate exclusively to the persons of the contracting parties, for example, treaties guaranteeing the throne to a particular sovereign and his family, and the latter are treaties for national objects, independent of the rulers of the state. While personal treaties expire with the death of the sovereign, or the extinction of his family, real treaties bind the contracting parties independently of any change in the sovereignty of the states. The constitution of each particular state must be looked to, to determine in whom the power of negotiating and contracting treaties with foreign powers resides. In monarchies, whether absolute or constitutional, it is usually vested in the sovereign. By the constitution of Great Britain, the exercise of this power is subject to parliamentary censure: ministers who advise the conclusion of any treaty which shall afterwards be judged derogatory to the honour, or disadvantageous to the welfare of the nation, being liable to impeachment, a proceeding of which English history affords numerous instances; as the impeachment of De la Pole, Earl of Suffolk, in 1451, for making a convention of peace without the assent of the privy council; of Wolsey, in 1529, by the House of Lords, for making treaties without the king's knowledge; and of the Earl of Orford by the Commons, in 1701, for advising treaties for dividing the dominions of Spain. In republics, the chief magistrate, senate, or executive council is intrusted with the exercise of this sovereign power. The constitution of the United States of America (art. ii. sec. 2) vests it in the president, with the advice and consent of the senate. No special form of words is necessary for the validity of a treaty; but modern usage requires that an agreement which has originally been verbal, should as soon as possible be committed to writing. There are certain compacts between nations which are included in the exercise of a general implied power confided to certain public agents as incidental to their official position. Such are the acts of generals or admirals limiting hostilities by truces, capitulations, or cartels for the exchange of prisoners, which do not require the ratification of the supreme authority, unless there be a reservation making that necessary. In other cases, however, a public minister or other diplomatic agent is not entitled to conclude or sign a treaty with the foreign power to which he is accredited, without a full power independent of his general letter of credence. Even in the case of a treaty concluded with full powers, it is often considered expedient to have a special ratification by the sovereign, or other proper authority of the state contracting.

A treaty is considered to be extinguished when one of the contracting powers loses its existence as an independent state, when the internal constitution of either state is changed so as to make it inapplicable; and in case of war between the contracting parties, unless the stipulations of the treaty have been expressly with a view to the rupture. As there is often a difficulty in distinguishing stipulations perpetual in their nature, from those that are extinguished by war, it is common to insert clauses in treaties of peace reviving and confirming the treaties formerly subsisting between the contracting parties.

A Treaty of Guaranty is an engagement by which one state promises to aid another when it is disturbed, or threatened to be disturbed, in the peaceable enjoyment of its rights by a third power.

Treaties of alliance may be offensive or defensive; in the former, the ally engages generally to co-operate in hostilities against a specified power, or against

any power with which the other may be at war; in the latter, the engagements of the ally extend only to a war of aggression commenced against the other contracting party.

The execution of a treaty is occasionally secured by hostages; as at the peace of Aix-la-Chapelle, in 1748, when several peers were sent to Paris as hostages for the restoration of Cape Breton by Great Britain to France.

TRE'BBIA, a small but famous stream of Italy, rises in the Ligurian Apennines, near Montebruno, flows northward through a mountain valley for the greater part of its course, and joins the Po, two miles west of Piacenza. Its entire length is about 50 miles. Here Hannibal decisively defeated the Roman consul Sempronius, 218 B.C.

TRE'BIZOND, or TREBISOND (in Turkish, *Tarabezûn*), is a Turkish eyalet in the north-east of Asia Minor, stretching along the south-east shore of the Black Sea for 70 miles, with an estimated pop. of 250,000. The surface is mostly mountainous, the slopes towards the sea being thickly wooded. The eastern portion of the eyalet is known as Lazistan, from its inhabitants, the Lazi, a savage vindictive race, distinguished among their neighbours for their barbarous manners, predatory habits, and intense hatred of Russia, whose frontier forms the eastern boundary of their country. The chief places of T. are Tchuruksû, Batum, Khopah, Atina, Rizeh, and Surmeneh. The chief town of the eyalet is TREBIZOND, a flourishing seaport city, on the Black Sea coast, about 110 miles northwest of Erzerum. It is surrounded by walls of great extent, which enclose numerous gardens as well as the town itself, and is inhabited by a pop. of 20,000—30,000, chiefly Moslems. Outside the walls are various suburbs, where most of the Christian inhabitants reside, and in which the principal bazaars and khans have been established. The city is defended by several forts along the walls, and by a fortified citadel perched upon a high rock on one side of the town. It possesses an excellent harbour, which, however, is only considered safe during the summer months, the roadstead of Platena, seven miles to the west, being employed for the rest of the year. There are numerous mosques and 'medresses,' ten churches for Greek Christians, copper foundries, dye-works, &c. The geographical position of T. is, in a commercial point of view, rivalled only by that of Alexandria, and has made it the great entrepôt of the commerce between Eastern Europe and Central Asia, and the second commercial city of the Turkish Empire. European goods are brought hither, since 1836, by regular services of steamers from Constantinople and the mouths of the Danube; and those of Asia by caravans from Erzerum, Tabriz, and Syria. In 1859, the imports amounted to £3,729,730; and the exports to £3,898,052; but in 1867 the imports had declined to £1,876,812, and the exports to £1,519,811. The arrivals and departures declined from 626 to 386 vessels. The goods brought overland embrace silk, wool, tobacco, wax, gall-nuts, oil, opium, drugs of various kinds, honey, timber, carpets, and shawls; and those arriving by sea are principally cotton cloths, glass, cutlery, firearms, as well as grain, iron, tin, spices, &c. T. is the ancient *Trapezus*, and was founded by a colony from Sinope; it was a flourishing town when Xenophon arrived there in his famous retreat from Persia, and was at that time under the dominion of the Colchians. Conquered from Mithridates by the Romans, it rapidly rose in importance, became a free city, was made by Trajan the capital of Pontus Cappadocicus; and, by the same enlightened ruler, was provided with a larger and better harbour. On the capture of Constantinople by the Crusaders in 1204, and the expulsion of the Comnenian emperors, one of the imperial family, Alexis, established himself at T., where he had previously exercised the functions of governor, and founded a state known as the *Empire of Trebizond*, which stretched from the Phasis to the Halys, and maintained its independence against the Turks till 1462, when the last emperor was defeated and captured by Sultan Mohammed II.

TREBLE, the highest part in harmonised music, which in general contains the melody, and is sung by a Soprano (q. v.) voice. The treble or G clef

is placed on the second line of the staff, indicating that the note G occupies the line encircled by its lower curve. It is one of the two clefs in use in music for keyed instruments.

TRE'DEGAR, a market-town on the north-west border of Monmouthshire, 18 miles north-west of Newport. It stands in the midst of a district with extensive iron-works and coal-mines, which give employment to the great mass of the inhabitants. Pop. about 15,000.

TREDGOLD, THOMAS, a celebrated English authority on architecture and engineering, was born at Brandon, a small village 2½ miles south-west of Durham, 22d August 1788. At the age of 14 he was apprenticed for six years to a cabinetmaker; but devoted his leisure time to the study of the principles of architecture, and kindred subjects. In 1808, he went to Scotland, where he worked as a journeyman carpenter for five years; then removed to London to his relative Mr Atkinson, the architect to the Ordnance Board, with whom he laboured till 1823, by which period his private business had increased so much that he commenced business on his own account as a civil engineer. During the ten years of T.'s residence with Mr Atkinson, he studied with redoubled zeal, and obtained a thorough acquaintance with mathematics, chemistry, mineralogy, and geology. He died from pure exhaustion of nature, 28th January 1829, at the early age of 40. T.'s scientific contributions to periodicals range over a wide field; but his great and valuable works are *The Elementary Principles of Carpentry, a Treatise on the Pressure of Beams and Timber Frames, the Resistance of Timber, the Construction of Floors, Roofs, Centres, and Bridges* (4to, 1820; 2d ed., 1828); and the *Strength of Cast Iron* (1821; 2d ed., 1824; 3d ed., 1831). His other works, the *Principles of Warming and Ventilating Public Buildings*, &c. (1824); *Practical Treatise on Railroads and Carriages* (1825); a pamphlet entitled *Remarks on Steam-navigation*, &c. (1825); and *The Steam-engine* (1827), were also received with special favour, and of the first and last of them new editions were speedily required.

TREE, the name given to those plants which live for many years, and have woody stems and branches, the stem being generally single, and bearing a head of branches and twigs; whereas Shrubs (q. v.) have generally a number of stems springing from one root. The terms tree and shrub are not, however, of very exactly defined signification; and many shrubs, under certain circumstances, assume the form of trees, either naturally or by the help of art; whilst trees are, in other circumstances, converted into shrubs. The common hawthorn, for example, is very often a mere shrub, but sometimes appears as a tree, with stem and head as perfect as the greatest monarch of the forest. The gooseberry bush is usually trained in our gardens in a tree-like

habit, notwithstanding its small size, and the shortness of its stem; this, however, is entirely artificial, its natural habit being that of a shrub, to which, but for the gardener's knife, it would almost certainly relapse in a single year. The greater number of trees are exogenous. Palms are almost the only endogenous plants to which this name can be given. Very different from the ordinary exogenous trees are the Gymnogens (q. v.) of Lindley—firs, pines, yews, &c. Trees are found in all climates except the coldest, but the number of species, as well as the luxuriance of the forests, is greatest in the tropics. As we advance towards the polar regions, or ascend high mountains, trees disappear before other forms of vegetation. The different characters of trees affect very much the landscape of the countries in which they grow; some countries, and particularly in northern parts of the world, being covered with sombre pine forests, whilst others abound in ash, beech, and similar trees of verdant foliage. Every kind of tree has its peculiar character, not only in its foliage, but in its general form and its mode of branching. An ash is as easily distinguished from an elm, by a practised eye, in winter, when destitute of leaves, as in the full foliage of summer. Some trees attain a very great age, but the ordinary duration of life is very different in different species. There are trees in England which are supposed to be more than a thousand years old, and are still healthful and flourishing. Oaks and yews are amongst the trees of longest life. The Baobab of Africa is also regarded as a very long-lived tree.

No acotyledonous plant assumes the character of a tree, except a few ferns, known as Tree Ferns.

TREE FERNS are ferns with tree-like woody stem, and a head of fronds resembling the leaves of palms. They are found only in tropical and subtropical countries, many of which, however, are quite destitute of them. One species, *Alsophila*

Tree Fern.

giganlea, which has a thick black trunk surmounted by a feathery crown, is found in the Himalaya, at an elevation of 7000 feet, and might be introduced with some probability of success into Britain. The soft central part of the stem of *Cyathea medullaris* an article of food in New Zealand. Tree Ferns are a characteristic feature of the vegetation of New Zealand.

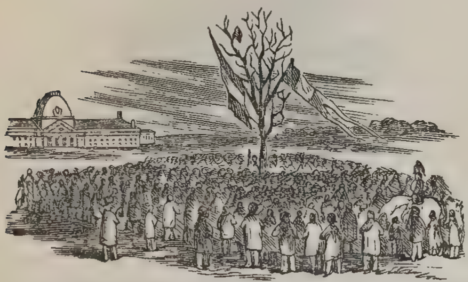
TREE-FROGS (*Hyladæ*), a family of tailless *Batrachia* (q. v.), of the suborder *Arcifera*, separated from the true frogs (*Raniformia*) by the presence of arched cartilages on the sternum. They generally possess dilated discs or suckers at the tips of the toes

Tree-frog (*Hyla viridis*).

which are covered with a viscid secretion, and enable the animals to climb trees. Most of them are arboreal; they are of various sizes, more elegant in form than the true frogs, of brighter colours, and more active habits. They feed on insects, which they pursue on the branches and among the leaves of trees or shrubs, stealing towards them, and suddenly springing upon them. They deposit their spawn in water, like other batrachians—some of them on the edges of leaves hanging over water—and hybernate in mud. Their croaking is louder than that of true frogs, and the traveller is sometimes amused by hearing it from the tops of high trees. No species of Tree-frog is found in Britain; one occurs in the middle and south of Europe; it is also found in Asia and the north of Africa; in the warmer regions of the Old World they are replaced by Ranoid genera adapted for tree-life. They are found more abundantly in America, and occur in Australia, their true home being in these continents. The TREE-FROG of Europe (*Hyla arborea*) —*Rainette* of the French—is found chiefly in moist woods, and in hedges near water. Although a small creature—one of the smallest of European frogs—it can make a spring of more than a yard in height to seize an insect. It becomes very noisy on the approach of rain, and is often kept in confinement, to serve as a weather indicator. Very similar to it is the COMMON TREE-FROG of North America (*H. versicolor*), which is abundant in the middle and northern parts of the United States as far west as the Mississippi, but is replaced in the south by the GREEN TREE-FROG (*H. viridis*), whilst other species are found in different parts of the country.

TREES OF LIBERTY. The custom, peculiar to almost all the nations of Europe, of celebrating the beginning of spring and various national and ecclesiastical festivals by setting up green boughs, led, during the war of independence in the United States, to the habit of planting poplars and other trees as the symbol of growing freedom. This example was imitated during the French Revolution. The Jacobins in Paris are said to have planted the first tree of liberty in 1790; and the custom spread rapidly through the whole of France. These trees,

crowned with the cap of liberty, were soon to be found in every village, while the people danced round them, singing revolutionary songs, and regarded them as the rendezvous of the patriots. Poplars were at first employed, but afterwards oaks, were substituted in their place. This custom was regulated by a decree of the Convention, and diffused over foreign countries by the republican armies. During the Reign of Terror, thousands lost their lives under the pretext of having injured a tree of liberty. During the Empire, this custom, like all others that had originated during the Republic, was completely suppressed. In the July revolution of 1830, trees of liberty were again set up, particularly at Paris; but the populace took no interest in the matter. During the February revolution of 1848, trees of liberty once more came into



M. Ledru Rollin addressing the people under the Tree of Liberty in the Champ de Mars, 1848.

vogue at Paris and other places where the inhabitants held republican principles. They were generally hung with tri-coloured ribbons, circles, and triangles, the symbols of unity and equality, and surmounted with the cap of liberty. In Paris, on the occasion of erecting a tree of liberty, a priest was frequently conveyed to the spot for the purpose of consecrating it. After most of the trees of liberty had fallen during the conflicts in the streets of Paris in June 1848, government issued an order for their removal from all places where they impeded traffic. Before the end of the year, they had entirely disappeared. Numerous trees of liberty were likewise erected in Italy during the revolution of 1848 and 1849, but fell again as the different insurrections were quelled. A very learned and interesting treatise has been written on this subject by the Abbé Grégoire.

TRE'FOIL, a name given to many herbaceous plants with leaves of three leaflets, as Clover (q. v.), Lotus (q. v.), Medick (q. v.), Buckbean (q. v.), &c.

TREFOIL, in Heraldry, is a frequent charge, representing the clover-leaf, and is always depicted as *slipped*, i. e., furnished with a stalk.

Trefoil in Heraldry.

Trefoil in Architecture.

TREFOIL, in Architecture, a three-lobed aperture in tracery, &c.

TRE'LLIS, an open grating or lattice-work, formed in wood, iron, &c.

TREMATO'DA, or **TREMATODE WORMS**, constitute, according to Dr Cobbold's system, the second order of the sub-class *Sterelmintha*, of the class *Helmintha*. This order, as the Greek word *Trēmatōdes* indicates, is characterised by the possession of certain pores or openings. All the animals included in it have soft, roundish, or flat bodies, and their visceral organs are lodged in the parenchyma of the body. They have a mouth and an intestine, which usually soon bifurcates, the two primary digestive tubes usually running parallel to one another, until they reach the caudal extremity, giving off in their course branches, which like themselves, terminate in blind sacs. Most of the T are hermaphrodites. They seldom attain to a large size, but are usually visible to the naked eye; the largest species vary from one to five inches in length, while the former forms scarcely exceed the $\frac{1}{100}$th of an inch at their longest diameter.

The Trematoda, or flukes, as they are popularly called, from their resemblance in form to small flukes or flounders, are not parasitic during the whole period of their existence; 'for while passing through the cycle of their life-development, they frequently change their residence, at times inhabiting either open waters, or the dewy moisture of low pasture-grounds. They perform active and passive migrations from parasitic to non-parasitic abodes; and during their larval wanderings in search of a final resting-place which should prove suitable to their adult condition, they provisionally occupy the bodies of different kinds of invertebrata.' —Cobbold's *Entozoa*, 1864, p. 15. In his *Synopsis of the Distomidæ* (published in 1861), Dr Cobbold recognises 344 species of flukes, of which 126 belong to fishes, 47 to reptiles, 108 to birds, 58 to mammals, and 5 to the invertebrata. He now believes that, at the very lowest possible estimate, we must assume the order to contain 400 species, which may be divided into the five families of *Monostomidæ*, *Distomidæ*, *Tristomidæ*, *Polystomidæ*, and *Gyrodactylæ*—names which are based, except in the last case, on the number of their pores or oval suckers.

Van Beneden arranges these families into (*a*) *Monogenea* and (*b*) *Digenea*, the development in the former being simple, while in the latter there is an alternation of generation, the nurses and larvæ living chiefly in molluscs, while the adult animals chiefly live in the bodies of vertebrate animals. The *Monostomidæ* and *Distomidæ* belong to the latter, and the others to the former group. The family of *Distomidæ* embraces the principal and best-known genera of the order *Trematoda*, and its members are at once recognised by the presence of two pores or suckers; one, the anterior, being connected with the mouth; and the other, termed the acetabulum, being usually placed on the ventral surface, in the middle lines.

The following members of this order are of special interest, as very liable to infest man. *Fasciola hepatica*, described and figured in the article FLUKE, is not only common in all varieties of grazing-cattle, and especially the sheep, but has been found in the horse and ass, in the hare and rabbit, in the squirrel, beaver, kangaroo, &c., and is occasionally met with in man, not only in the liver and gall-bladder, but beneath the skin in various parts, as, for example, in the sole of the foot, behind the ear, and in the scalp. For an excellent account of the anatomy and development of this parasite, the reader is referred to Cobbold, *op. cit.*, pp. 147—169. See ROT. *Distoma lanceolatum* is a species which is by no means uncommon in the sheep and ox, and has been found on at least three occasions in the human subject. *Distoma ophthalmobium* has been occasionally found in the lens of the human eye. *Distoma hæmatobium*, or *Bilharzia hæmatobia*, as Dr Cobbold

terms it, is the only known trematode which is not hermaphroditic.

The male is a cylindrical worm, measuring only

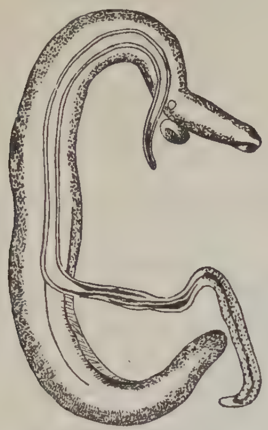


Fig. 1.—*Bilharzia hæmatobia*, male and female: Considerably magnified.

about half an inch in length; while the female is filiform, longer, and much narrower than the male, being about ¾ths of an inch in length. The first specimens were found by Bilharz of Cairo in the portal system, and the worm has since been found in the veins of the mesentery, bladder, and other parts. This parasite is common not only along the borders of the Nile, but in South Africa and the Mauritius. It is so common in Egypt, that in 363 examinations of the body after death, Griesinger found it no less than 117 times.

The principal feature of the disease caused by this worm consists in a general disturbance of the uropoietic function. Diarrhœa and hæmaturia occur in advanced stages of the complaint, being also frequently associated with the so-called Egyptian chlorosis, colicky pains, anæmia, and great prostration of the vital powers. The true source of the disorder, however, is easily overlooked, unless

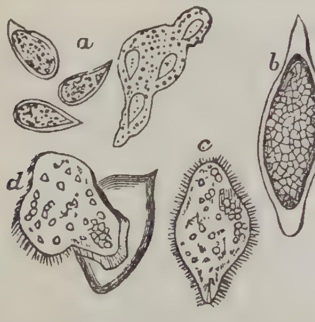


Fig. 2.—Eggs and Embryos of *Bilharzia hæmatobia*: *a*, three ova (× 50 diam.) and a portion of mucous membrane with eggs attached (× 25 diam.); *b*, egg with segmented yelk; *c*, free embryo; *d*, ruptured egg with embryo escaping (× 150 diam.).—From Dr John Harley.

a careful microscopical examination be made of the urine and other evacuations. If blood be mixed with these, and there also be a large escape of mucus, a minute inspection of the excreta will scarcely fail to reveal the presence of the characteristic ova of *Bilharzia*.—Cobbold, *op. cit.*, p. 202. Dr J. Harley has published several excellent papers 'On the Hæmaturia of the Cape of Good Hope, produced by a Distoma,' which is undoubtedly the *Bilharzia*.

Several other trematodes occasionally occur in the human subject.

TREME'LLA, a genus of Fungi, of the division *Hymenomycetes*, soft and gelatinous, of no very determinate form, mostly growing on decaying wood. Several species are found in Britain. In some places, they receive such popular names as Witches' Meat and Witches' Butter. Superstitious notions have been connected with them, and a medicinal value altogether imaginary has been ascribed to them.

TRE'MOLITE, a mineral regarded as a variety of Hornblende (q. v.). It is composed of silica, magnesia, lime, and a very little fluoric acid.

TRE'MOLO, TREMA'NDO (Ital. trembling), in Music, an expression indicating that a note or a chord is to be reiterated with great rapidity for an indefinite number of times, so as to produce a tremulous sort of effect. In singing, *tremolo* effects may on rare occasions be introduced with advantage, but are often resorted to by inferior singers as an artifice to conceal defects of tone and style.

TRE'NAILS, pieces of wood which are used as nails in ship-building. They are usually about 15 or 18 inches in length, and when completed, at least 1 inch in thickness. They are made chiefly of locust-wood (*Robinia pseudo-acacia*), or of oak; the former are imported from North America, the latter from Northern Europe. Great Britain imports of these small pieces of wood as much as £5000 worth annually.

TRENCH. See SIEGE.

TRENCH, RICHARD CHENEVIX, Archbishop of Dublin, divine and scholar of the Church of England, belongs to an Anglo-Irish family of Galway, the Trenches of Woodlawn, and was born at Dublin, 9th September 1807. He was educated at Harrow and Trinity College, Cambridge, where he graduated in 1829. After travelling for a few years, he became a country curate; and in 1837 or 1838, published two volumes of poetry, which had at least the merit of imitating Wordsworth, and were favourably received. One of the poems, the *Story of Justin Martyr*, is even yet faintly remembered. In 1845, T. was presented to the rectory of Itchin Stoke; in 1847, he became Theological Professor and Examiner in King's College, London; in 1856, Dean of Westminster; and in 1864, on the death of Whately, Archbishop of Dublin. T. has written extensively and well. He has a quick, keen understanding; his scholarship is varied and choice, though not sufficiently precise or scientific for philological purposes; his fancy, sometimes poetic, and always picturesque, enables him to invest the dry discussion of words with a peculiar fascination; and if the results of his etymological inquiries are not always sure, the processes are invariably pleasant. As a literary critic, T. is both acute and elegant. His principal works are: *Notes on the Miracles* (1846), *Notes on the Parables* (1841), *The Lessons in Proverbs* (1853), from all of which his professional brethren have borrowed liberally for the work of the pulpit; *The Sermon on the Mount illustrated from St Augustine* (1844), *Sacred Latin Poetry* (1849), *St Augustine as an Interpreter of Scripture* (1851), *Synonymes of the New Testament* (1854), *The Epistles to the Seven Churches of Asia Minor*, *An Essay on the Life and Genius of Calderon*, *Deficiencies in our English Dictionaries*, *Glossary of English Words used in*

different Senses (1859), *The Study of Words* (1851), and finally, the *Remains of Mrs Richard Trench* (1862), his mother. In 1832 he married his cousin, the Hon. Frances Mary Trench, sister of Lord Ashtown. [Died in 1886.]

TRENCK, FRANZ and FREDERICK VON DER, were German barons and soldiers, whose adventures, recorded in autobiographies, have secured for them a world-wide fame. They were cousins, descended from an ancient house of East Prussia, and although placed from infancy under circumstances altogether different, exhibited a striking similarity of character. Both were braggarts, both were subject to fits of uncontrollable passion, and both told premeditated lies.

BARON FRANZ was born in Reggio, in Calabria, on 1st January 1711, when his father was an Austrian general. When 17, he received a commission as a cavalry officer, fought duels, and cut off the head of a man who refused to lend him money. He had to flee in consequence, and he went to Russia, where he was made a captain of hussars. He was then a formidable young giant of 6 feet 3 inches; and it is highly probable that he knocked down his commanding officer, as he says he did, for rebuking him. He adds that he was placed under arrest while an engagement was going on; that Marshal Münnich happening to pass, he called out that if set free and pardoned he would bring back three Turks' heads in an hour; that he was set free, and brought back four Turks' heads suspended from his saddle. This story may or may not be true; but certain it is that he was cashiered not long afterwards, and returned to settle on his estates in Croatia. There it is we first meet with the T. of history. The Turkish frontier was overrun with banditti. T. armed and drilled 1000 of his tenants, whom he called Pandours, and by their means succeeded in restoring order. He then offered the services of his regiment to Maria Theresa, and his aid was accepted. In 1740, he took part in the Silesian war at the head of his men, and perpetrated the most atrocious deeds of rapine and cruelty. There had been no such monster, says Mr Carlyle, since Attila and Genghis. On the 7th of September 1742, he attacked Cham, a fine trading town in neutral territory, this act being, of course, in defiance of all law and discipline; and he completely annihilated it. After the battle of Sohr, in September 1745, he offered to capture Frederick the Great, and bring him a prisoner to the Austrian camp. He failed in the enterprise, with great loss of men, but he secured the king's tent and much valuable booty. Suspicions were, however, entertained of his being in communication with the enemy, and he was tried by court-martial. He was imprisoned at Vienna, but made his escape with the assistance of the Baroness Lestock, who bribed the jailers to allow him to be conveyed in a coffin as if dead beyond the city walls, was again captured at Bruges, and reimprisoned at Grätz, where he took poison, and died on 4th October 1747. —See Carlyle's *Life of Frederick the Great;* and *Mémoires du Baron Franz de Trenck* (Par. 1787), written by himself.

FREDERICK VON DER T. was born at Königsberg, in 1726, and was the son of a major-general in the Prussian service. He distinguished himself at the university. At 16, he became a cornet in the guards; and two years afterwards, the Princess Amalie, who saw him at a ball, we are told, conceived a violent passion for him. To this he attributed the antipathy the king afterwards entertained towards him. There was, however, a much better reason: he was detected in a correspondence with his Austrian cousin, not long before the attempt to capture the king, and arrested. Mr Carlyle shews that the baron had been in prison three months, and was there when the battle of Sohr took place, although he vividly describes his own adventures in the fight. He was accused of this lie in his own time, and admitted that he must have made a mistake! 'He had nothing but his poor agitated memory to trust to.' He was released on 24th December 1763, and afterwards settled at Aix-la-Chapelle, where he married the burgomaster's daughter, and went into business as a wine-merchant. He published his Memoirs in 1787. The book was translated into all languages, and T. became the most famous personage of his time. The ladies at Paris, Berlin, and Vienna wore bonnets, dresses, and rings *à la Trenck;* and no less than seven plays, founded on his adventures, were brought out on the French stage. In 1792, he went to Paris, and became a zealous adherent of the Mountain party. He was, however, suspected, and thrown into prison. Soon after rumours in circulation among the prisoners, that the Prussians were advancing on Paris, and carrying all before them, were traced to T., who was in consequence condemned. He was guillotined near the Barrière du Trône, July 26, 1794. On the scaffold, although 69 years of age, he manifested the ungovernable passion which had characterised him through life. He harangued the mob; and at length the executioner had by force to hold his head by the gray hair on the block, to meet the fatal stroke. —See Chambers's *Book of Days,* vol. i. p. 261; Carlyle's *Frederick the Great,* vol. iv.; *Friedrich Trencks Werkwürdige Lebensgeschichte von ihm selbst beschrieben* (2 vols., Berl. 1787); and *Leben und Thäten der Trenke,* by Watermann (2 vols., Leip. 1837).

TRENT, a river of the midland counties of England, rises on the north-west border of Staffordshire, about 10 miles north of Burslem, and at a height of about 600 feet above sea-level. It flows first south-east to the border of Derbyshire, and afterwards in a general north-east direction through the counties of Derby, Nottingham, and Lincoln, to a point about 8 miles east of the town of Goole, where it unites with the Ouse (q. v.) to form the Humber (q. v.). It receives the Derwent, Idle, and Tarn from the west, and the Soar from the south; its length is 170 miles, for 120 miles of which, from its mouth up to Burton-on-Trent, it is navigable for barges.

TRENT (Ital. *Trento,* Ger. *Trient,* Lat. *Tridentum*), a walled town of Austria, in the southern part of the Tyrol, capital of the circle of the same name, is situated on the left bank of the Adige (here spanned by a wooden bridge 146 feet long), in a beautiful and fertile valley, surrounded by high limestone hills, 46 miles north of Verona. In its general aspect, as well as its architecture, T. is quite an Italian town; and with its spires and towers, ruined castles and ancient embattled walls, it presents an imposing appearance from a distance. The *Piazza Grande,* near the Cathedral, is adorned with a splendid fountain of red marble, surmounted by a colossal statue of Neptune with his trident. The cathedral, begun in 1212, is a beautiful specimen of the Romanesque style of Lombardy, with a few features suggestive of the contemporary German style; united to it is a fragment of the episcopal palace of the 12th century. The Church of Santa Maria Maggiore is built on the site of the council-chamber in which the famous 'Council of Trent' held its sittings. Among other public buildings are the Church of the Jesuits, ornamented with the richest foreign marble; the New Theatre (holding 1400 people; the town-hall; and the Palazzo Buonconsiglio adjoining the town, a noble specimen of the feudal architecture of North Italy, now

occupied as a barrack. Its benevolent and educational establishments are numerous. T. carries on considerable manufactures of silks, wine, tobacco, and sugar, and has a large transit-trade. Pop. 17,000.

The ancient *Tridentum*, or *Tridente*, derived its name from the *Tridentini*, an Alpine tribe, whose capital it was, and has, in all probability, no connection whatever with the *trident* of Neptune (as is commonly supposed). Conrad the Salic bestowed on the prince-bishops of T. the temporal rule of the valley of the Adige, and under them T. rose to great prosperity and importance. It is still the see of a prince-bishop.

TRENT, Council of, the last in order of the assemblies regarded by the Roman Catholic Church as ecumenical or general, and the great repository of all the doctrinal judgments of that communion on the chief points at issue with the reformers of the 16th century. Very early in his conflict with Pope Leo X., Luther had appealed from the pope to a general council; and after the failure of the first attempts at an adjustment of the controversies, a general desire grew up in the church for the convocation of a general council, in which the true sense of the church upon the controversies which had been raised might be finally and decretorially settled. Another, and, to many, a still more pressing motive for desiring a council, was the wish to bring about the reform of the alleged abuses as well of the court of Rome as of the domestic discipline and government of local churches, to which the movement of the reformers was in part at least ascribed. But the measures for convoking a council were long delayed, owing partly, it has been alleged, to the intrigues of the party who were interested in the maintenance of those profitable abuses, and especially of the officials of the Roman court, including the cardinals, and even the popes themselves; but partly also to the jealousies, and even the actual conflicts, which took place between Charles V. and the king of France, whose joint action was absolutely indispensable to the success of any ecclesiastical assembly. It was not till the pontificate of Paul III. (1534—1549) that the design assumed a practical character. One of the great difficulties regarded the place of meeting. In these discussions, much time was lost; and without entering into detail, it will suffice to say that the assembly did not actually meet till December 13, 1545, when 4 archbishops, 22 bishops, 5 generals of orders, and the representatives of the emperor and the king of the Romans, assembled at Trent, a city of the Tyrol. The number of prelates afterwards increased. The pope was represented by three legates, who presided in his name—Cardinals del Monte, Cervino, and Pole. The first three sessions were devoted to preliminaries. It was not till the fourth session (April 1546) that the really important work of the council began. It was decided, after much disputation, that the doctrinal questions and the questions of reformation should both be proceeded with simultaneously. Accordingly, the discussions on both subjects were continued through the fourth, fifth, sixth, and seventh sessions, in all which matters of great moment were decided; when a division between the pope and the emperor, who, by the victory of Mühlberg, had become all-powerful in the empire, made the former desirous to transfer the council to some place beyond the reach of Charles's arbitrary dictation. The appearance of the plague at Trent furnished a ground for removal, and in the eighth session a decree was passed (March 11, 1547) transferring the council to Bologna.

This translation was opposed by the bishops who were in the imperial interest, and the division which ensued had the effect of suspending all practical action. Meanwhile, Paul III. died. Julius III., who had, as Cardinal del Monte, presided as legate in the council, took measures for its resumption at Trent, where it again assembled, May 1, 1551. The sessions 9—12, held partly at Bologna, partly at Trent, were spent in discussions regarding the suspension and removal; but in the 13th session the real work of the assembly was renewed, and was continued, slowly, but with great care, till the 16th session, when, on account of the apprehended insecurity of Trent, the passes of the Tyrol having fallen into the hands of Maurice of Saxony, the sittings were again suspended for two years.

But the suspension was destined to continue for no less than nine years. Julius III. died in 1555, and was followed rapidly to the grave by his successor (who had also been his fellow-legate in the Council as Cardinal Cervino), Marcellus II. The pontificate of Paul IV. (1555—1559) was a very troubled one, as well on account of internal difficulties as owing to the abdication of Charles V.; nor was it till the accession of Pius IV. (1559—1565) that the Fathers were again brought together to the number of 102, under the presidency of Cardinal Gonzaga, re-opening their deliberations with the 17th session. All the succeeding sessions were devoted to matters of the highest importance —communion under one kind; the sacrifice of the mass; the sacrament of orders, and the nature and origin of the grades of the hierarchy; marriage, and the many questions connected therewith. These grave discussions occupied the sessions 17—24, and lasted till November 11, 1563. Much anxiety was expressed on the part of many bishops to draw the council to a conclusion, in order that they might be enabled to return to their sees in a time so critical; and accordingly, as the preliminary discussions regarding most of the remaining questions had already taken place, decrees were prepared in special congregations comprising almost all the remaining subjects of controversy, as purgatory, invocation of saints, images, relics, and indulgences. Several other matters, rather of detail than of doctrinal principle, were referred to the pope, to be by him examined and arranged; and on the 3d and 4th of December 1563, these important decrees were finally read, approved, and subscribed by the members of the assembly, consisting of 4 cardinal legates, 2 other cardinals, 25 archbishops, 168 bishops, 7 abbots, 7 generals of orders, and 39 proxies of bishops—making in all 252.

These decrees were confirmed, January 10, 1564, by Pius IV., who had drawn up, based upon them in conjunction with the creeds previously in use, a profession of faith known under his name. See Roman Catholic Church. The doctrinal decrees of the council were received at once throughout the Western Church, a fact which it is necessary to note, as the question as to the reception of the decrees of doctrine has sometimes been confounded with that regarding the decrees of reformation or discipline. As to the latter, delays and reservations took place. The first country to receive the decrees of the council as a whole was the Republic of Venice. France accepted the disciplinary decrees only piecemeal and at intervals.

It would be out of place here to enter into the question as to the merits of this unquestionably great and momentous assembly, which may be said to have practically decided the religious destinies of the Western Church. It is viewed with directly opposite impressions by opposing critics, and it is commonly even said that in the Catholic Church itself the Council of Trent has met its worst adversary in the person of one of the priests of its own creed, the Servite monk, Fra Paolo Sarpi.

It must be confessed, however, that the most candid of modern inquirers have shewn that Sarpi cannot fairly be regarded as a Roman Catholic. His sympathies are all strongly anti-Roman, and there are abundant indications in his work of a rationalising tendency, which plainly ought to rank him among the partisans of that free inquiry which it has been the object of Trent to repress by judgment, pronounced once for all, and excluding all controversy. See SARPI. And although there are perhaps equal exceptions against the impartiality of his rival historian and antagonist, Pallavicino, the latter is admitted by Ranke, Raumer, and others to be far more reliable in the use of documents than his Servite adversary.

The canons and decrees of the Council of Trent were issued in Latin, and have been reprinted innumerable times. They have also been translated into almost every modern language; the most approved English translation being that of the Rev. Jeremiah O'Donovan. One of the supplementary works assigned to the pope by the council at its breaking up was the completion of a catechism for the use of parish priests and preachers. This work has not all the authority of the council, but it is of the very highest credit, and is extensively used, having, like the canons and decrees, been very generally translated. Another similar work was the publication of an authentic edition of the Vulgate version of the Bible, as well as of the Missal and Breviary. All these have been accomplished at intervals; and there is besides at Rome a permanent tribunal, a congregation of cardinals, styled Congregatio Interpres Concilii Tridentini, to which belongs the duty of dealing with all questions which arise as to the meaning, the authority, or the effect of the canons and decrees of this celebrated council. See SARPI, PIUS IV., PALLAVICINO.

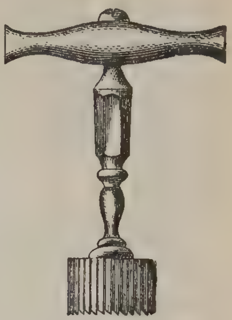
TRE'NTON, the capital city of New Jersey, U. S., on the left bank of the Delaware River, at the confluence of Assunpink Creek, and head of steam-navigation, 30 miles north-east of Philadelphia, and 57 south-west of New York; a well-built and handsome city, with a fine view of the river. It contains the state Capitol; state lunatic asylum, for 325 patients; state normal school; penitentiary, with 317 inmates; state library, of 8000 vols.; 22 churches; 5 newspapers; extensive railway connections; and manufactories of locomotives, machinery, cannon, rifles, wire, wire-cordage, crockery, terracotta, cotton, woollen, paper, &c. In the war of the Revolution, T. was the scene (December 25, 1776) of a night-attack by Washington upon the British troops, whom he surprised by crossing the Delaware, when the floating ice was supposed to have rendered it impassable. Pop. (1870) 22,874; (1880) 29,910.

TRENTON FALLS, a village of New York, U. S., on West Canada Creek, 15 miles north-west of Utica, celebrated for its beautiful cascades (6 in number), with an aggregate fall of 312 feet, in a deep ravine, 2 miles long, with walls of rock in places 150 feet high.

TREPA'N. See TREPHINE.

TREPA'NG. See BÊCHE-DE-MER.

TREPHI'NE AND TREPHINING. (The instrument in its original form was called a *trepan*, from Gr. *trupao*, allied to Lat. *tereo*, to bore; the now usual form is called a *trephine*.) The operation of trephining consists in the perforation of a bone by means of a trephine, which is a small cylindrical or circular saw, with a centre-pin on which it works. It is practised on the skull in cases of fracture: '1st, when a portion of the bone is depressed, and encroaches on the cavity of the skull, producing compression of the brain, and the fragment cannot otherwise be raised; 2dly, for punctured fractures by which the inner table is splintered, separated from the outer table, and lying loose on the dura mater; and 3dly, for effusion of blood, or of inflammatory products, between the bones and membranes, or between the latter and the brain, when it is presumed that the effused fluid may be evacuated by the opening.'—Holmes's *System of Surgery*, vol. iv. p. 1044. It has likewise been employed in epilepsy, with the view of removing an assumed local cause of disturbance; but it is not likely to be ever again used in that disease, as it is now an established axiom, that as the operation itself may destroy life, its application is not justifiable, except as the last resource of surgery in extreme cases.



Trephine.

Attempts have been made by various surgical-instrument makers to regulate the action of the trephine by means of a movable collar, so as to prevent the brain from being injured after the skull has been perforated. For the method of applying the instrument, we may refer to any work on Operative Surgery.

TRE'SPASS as a legal term, in the Law of England, means any wrong or injury committed upon either the person or property of an individual, not amounting to a crime. As regards a trespass to the person, the more familiar term is an assault or imprisonment; but trespass as to goods and chattels is more commonly known under the names of the remedies applied, as, for example, actions of Trover (q. v.), Detinue (q. v.). Trespass is the technical as well as popular name for that kind of injury which is done to a man's land or house by intruding into it against his will. In English law, the maxim is well known, that every man's house is his castle, and he is entitled to treat as an enemy any person who attempts to enter without his leave. There are, however, a few exceptions to this rule of the inviolability of a man's house, for it is no protection against the officers of the law when executing criminal process—for example, coming to apprehend a person charged with crime. But, as regards mere civil warrants, the officers of the law have no right to break open a man's outer door in order to effect an arrest for debt; and no civil court can give the bailiff such a power. The consequence is, that the bailiff can only wait outside, or endeavour by some stratagem to get inside the house in a peaceable manner; and if once inside the outer door, he can then break his way through the house, in order to find his debtor. Such is the law as to intruding into a man's house armed with the authority of the law.

It is a general rule applicable to a man's house as well as land, that if a stranger enter without leave, and do not quit at the request of the owner (who is not bound to state any reason for his request), the owner may by force eject the intruder. In doing so, however, he must not use more force than is necessary to overcome the resistance offered. If the intruder enter with force, the owner may turn him out without even first requesting him to depart; but if the intruder enter quietly, he must first be requested to leave before hands can be put upon him. If, in turning a stranger out, the stranger assault the owner, then the latter may defend

himself; but a policeman cannot interfere, or rather it is not compulsory upon him to interfere, unless he sees an assault committed by the intruder. Sometimes it is erroneously believed that a person is entitled to go to another's house on lawful business, and insist on admission, and even to remain till he get an answer—such as a creditor to demand his money; but this is not so. A creditor may be ordered away, and has no more right to intrude than any stranger. It is also sometimes erroneously supposed that any member of the public is entitled to enter into certain public places, such as a shop or a theatre; but this is not so. Any shopkeeper can turn any person he pleases, at any moment, out of his shop, and is not bound to deal with any person except he chooses. So with a keeper of a theatre or other place commonly described as public places. There is an exception, however, as to an Innkeeper (q. v.), who is bound, if he have accommodation and the means, to admit a traveller requiring refreshment. As to all other places, the general rule is, that whoever is the occupier of a house, or of land, is exclusively entitled to possession, and can extrude any person who refuses on request to leave; or if he prefer to resort to his legal remedy, he can sue such intruder in an action of damages. The amount of damages recovered will depend greatly on the circumstances attending the trespass, and whether insult or outrage was an accompaniment.

It is often erroneously believed by the public, as well as by some landlords or occupiers, and it is probably a wholesome delusion, that it is a criminal offence for a stranger to trespass upon lands, and that such stranger can be given into custody for doing so; and to keep up this impression, it is common for landlords or occupiers to stick up a notice with the words: 'Trespassers will be prosecuted.' But the fact of such a notice, or of there being a fence to the land, does not make any difference with regard to the trespasser, who is just as much liable to an action of damages, but to nothing else, for the trespass, whether he knew or not of such notice; and in neither case can he be given into custody, as if for a criminal offence. If, however, a trespasser were to break the trees, or do wilful damage (other than mere walking or riding) he may be liable to be apprehended; and if he is at the time trespassing with intent to catch or kill game, he may in some cases be apprehended and given into custody. See GAME, POACHING. It is a defect in the law that owners of land have no summary remedy except physical force to turn out or keep off trespassers, and that justices of the peace have no power to impose a moderate fine upon trespassers for repeating acts of trespass after notice that the owner or occupier dislikes them.

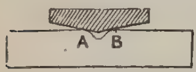
Not only human beings are trespassers, but the word is also by analogy applied to the trespasses of dogs, cats, and other animals. The trespasses of cattle are often of importance, in consequence of the damage done by them. The rule of law which governs the rights of occupiers of land on that subject is the following. An owner is not bound to fence his land, and whether fenced or unfenced, a neighbour is bound neither to trespass himself nor allow his cattle to trespass. If, therefore, A's cattle trespass on B's land, B can impound them; that is, he can lock them up, and keep possession till the owner pay for the damage done; or, if he prefer it, he can bring an action to recover the damages; or, he may drive them off, and also bring the action, until by one or or other remedy he is satisfied. With regard to dogs, cats, and similar domesticated animals, the rule is, that the owner is merely responsible for such mischief as they commit by reason of some negligence on his part. If, for example, he knows of some bad propensity they have to stray and attack or damage third persons, then it becomes his duty to take such means as will prevent their doing the mischief; but he cannot be held responsible unless and until the animals have on a former occasion done the mischief—in other words, it is only for a second and not a first offence that he can be made liable. There is one exception only to this rule, recently created by statute, viz., where dogs trespass and worry sheep; in that case, by a recent change made in the law of the United Kingdom, the owner of the dog is to pay for the damage, though he was not aware of any propensity in the dog to do such mischief.

In order to guard against trespass both of men and animals, the owners of land have sometimes resorted to spring-guns and man-traps, planted in their grounds. This practice was carried to a great height in England, as well as Scotland, about forty years ago. It was decided by the courts in England that there was nothing to prevent an owner from so protecting his land; but to put a limit to it, a statute was passed which restricted such right to dwelling-houses and gardens; so that now in England, it is illegal to place man-traps and spring-guns in open fields. As regards, however, traps to catch dogs, cats, or other animals, an owner of land is entitled to place these in his lands, and even to allure the animals with bait, so as to invite them to their doom; but this must not be done so close to a highway as to tempt a dog aside which is lawfully passing along the highway, for the owner of a dog being entitled to the use of the highway for the dog as well as himself, is entitled to have no danger placed in its way, such as a strong-smelling bait, which should operate irresistibly on its animal instincts. It is, therefore, only in the open fields or woods not adjoining the highway, that these dog or cat traps can be lawfully placed for protection of game or otherwise.—In Scotland, the law is substantially the same as regards trespass as it is in England or Ireland; but it was held illegal at common law in Scotland to put man-traps in lands by way of protection: and it is still illegal to do so. In Scotland, also, there is a more summary remedy against trespassers than exists in England, for an interdict may be obtained to prevent mere trespassers, irrespective of the game or fishery laws; and even justices of the peace may deal summarily with mere trespassers.

TRE′SSURE, in Heraldry, a subordinary, generally said to be half the breadth of the orle, and usually borne double, and flowered and counter-flowered with fleurs-de-lis. It forms part of the royal insignia of Scotland, which are: or, a lion rampant gules, armed and langued azure, within a double tressure flory counterflory of the second. The origin of the tressure in the arms of Scotland has been traced by the older heralds to the 9th c., when they relate that it was granted by Charlemagne to King Achaius of Scotland, in token of an ancient alliance between France and Scotland, and with the view of indicating that the French lilies would in time coming be a defence to the Scottish lion. Chalmers insinuates that these two monarchs were probably not aware of each other's existence; and, in point of fact, the double tressure is not known to have been borne earlier than the time of Alexander III., on whose seal it appears. The tressure is, however, held in great honour in Scottish heraldry, and Lyon King-of-Arms has not been permitted to grant it to any subject without a royal warrant; as a mark of especial favour, it has, however, occasionally been accorded by the sovereign to the representatives of important

families directly descended by a maternal ancestor from royalty, or who had deserved well of their king and country.

TREVELYAN EXPERIMENT (so called from the person who first carefully studied the phenomenon). When a block of iron or copper is considerably heated and laid on a block of cold lead, a sound of some intensity, and more or less musical, is often heard. Trevelyan, after many trials, adopted for the 'rocker,' as it is called, a form somewhat resembling a fire-shovel, with a thickish block of metal instead of the blade. This is poised delicately on the lead block, so as to bear with nearly equal pressure on two points separated by a groove; and the rounded end of the handle is also supported. The annexed fig. shews a section of the head of the rocker and of the lead block. The rocker being heated, suppose it poised so as to touch the lead at A only. It heats the lead at A, and therefore suddenly expands it near that point, since lead is a bad conductor of heat. Thus, the lead, as it were, swells up at A, and tilts the rocker over to B. There the same process takes place, and so on; and as the rocker thus moves alternately from A to B, the successive impacts, occurring at nearly equal intervals, form a musical sound. This can be altered at pleasure by loading the rocker, or by altering its moment of inertia. By proper care, almost any conducting body may be made thus to rock upon another, though, in the majority of combinations, the effect is very slight. The explanation of the phenomenon, as given above, is due to Faraday.



TRÈVES (Ger. *Trier*, Lat. *Augusta Trevirorum*), a town of Rhenish Prussia, with a population (1880) of 24,141, capital of the circle of the same name, lies on the right bank of the Moselle, in a lovely valley, between vine-covered hills, about 65 miles south-west of Coblenz. The river is here crossed by a bridge of 8 arches, 710 feet long, and 25 broad. T. is a decayed place, and covers an area large in proportion to its population, owing to the number and size of the open spaces where houses once stood. The cathedral of St Peter and St Helen is a very interesting structure of various antiquity, principally of the early German Romanesque style of the 11th c., but retaining considerable remains in the interior of a previously existing Roman church of the age of Constantine. It has beautiful altars and tombs; rich old chasubles and missals; famous relics, among others the 'Holy Coat' (q. v.). Adjoining the cathedral is the *Liebfrauen-kirche*, a very graceful specimen of Early German Gothic architecture, finished in 1243. The only other ecclesiastical buildings of interest now remaining, are the chapel of the Benedictine convent of St Mathias outside the town, and the church of the Jesuits. T. contains some beautiful old dwelling-houses of Romanesque architecture. No place in Germany is so rich in remains of the Roman period. Among these are the *Porta Nigra*, a colossal gateway, probably one of the five gates by which T. was entered in Constantine's time, the so-called Roman baths (more probably part of an imperial palace), and a basilica built of Roman brick by Constantine for a court of justice, which, after being successively the residence of the Frankish kings and archbishops, was in a great measure demolished to make room for an electoral palace erected in 1614; this has recently been removed, and the basilica restored and fitted up as a Protestant church. Beyond the walls are the ruins of an amphitheatre. The piers of the already mentioned bridge, consisting of enormous blocks of lava, are also of the Roman period.

T. is the seat of a bishop, and of a provincial council, has a chamber of commerce, a priestly seminary, gymnasium, a library of 96,000 vols. and numerous MSS., a museum full of valuable antiquities—including the famous *Codex Aureus*, or MS. of the Gospels in gold letters, presented to the Abbey of St Maximin by Ada, sister of Charlemagne—and various benevolent institutions; and it carries on manufactures of woollens, cottons, and linens, besides a brisk trade in corn, timber, and Moselle wines.

T. derives its name from the *Treviri* or *Treveri*, a Gallic, or, more probably, a Belgic people, who inhabited, in Cæsar's time, a large tract of country between the Meuse and the Rhine. Their capital, *Augusta Trevirorum*, probably became a Roman colony in the time of Augustus, and ultimately became the head-quarters of the Roman commanders on the Rhine, and a frequent residence of the emperors, particularly of Constantine. Under the Franks, into whose hands it fell 463 A.D., it continued to flourish. In 843, it passed to Lorraine; in 870, to Germany; in 895, back to Lorraine; and finally was united to Germany by the Emperor Henry I. The Archbishop of T. was, in virtue of his office of Chancellor of Burgundy, one of the electors of the Empire, a right which seems to have originated in the 12th or 13th c., and continued till the French Revolution. The ambition and talents of some of these episcopal rulers obtained for them great political weight in Germany. Since 1814, T. has belonged to Prussia.—See Haupt, *T.'s Vergangenheit und Gegenwart* (2 vols., Trier, 1822); Steiniger, *Geschichte der Trevirer unter der Herrschaft der Römer* (Trier, 1845); and Braun, *T. und seine Alterthümer* (Trier, 1854).

TREVI'SO, a town of Venetia, capital of the province of the same name, on the river Sile, in a very fertile country, 17 miles north of Venice. It is the seat of a bishop, and has a handsome though still unfinished Duomo, with five cupolas, and having an altarpiece of the Annunciation by Titian; and among the other buildings are the old Gothic church of San Nicolo, with a number of excellent pictures, and the public library (30,000 vols.). The town is surrounded by a wall of from 24 to 38 feet in height, and strengthened by numerous bastions. Manufactures of hardware are carried on; there are also a sugar-refinery, a bell-foundry, and a number of paper-mills. Population, 20,000.

TREVOR, SIR JOHN, Knight, born in 1633. In the parliament of James II. which met on 19th May 1685, he was elected Speaker of the House of Commons. 'Trevor,' says Macaulay, 'had been bred half a pettifogger, and half a gambler, had brought to political life sentiments and principles worthy of both his callings, had become a parasite of the Chief Justice' (Jeffreys), 'and could on occasion imitate not unsuccessfully the vituperative style of his patron. The minion of Jeffreys was, as might have been expected, preferred by James, was proposed by Middleton, and was chosen without opposition.'—*History of England*, vol. i. p. 508 (ed. 1849). In the same year, he was made Master of the Rolls. He contrived to maintain his political and judicial position after the revolution of 1688, and was again elected Speaker on the meeting of parliament on 20th March 1690, on an understanding with the government that he was to take the management of what may fairly be called the bribery department. At the same time, he acted as first commissioner of the Court of Chancery, in which

position his integrity seems from the first to have been greatly suspected; and though he was deficient neither in learning nor in parts, his judgments were both long in being given, and contemptible when they were pronounced. For some years, he maintained both his power and position; but his greed and venality at length became so notorious that respectable gentlemen of all shades of political opinion were ashamed to see him in the chair. In March 1695, a Committee of the House of Commons was appointed to investigate into the truth of certain charges of bribery brought against their Speaker. Within a week, the Committee reported, that in the preceding session, Sir John T. had received 1000 guineas from the city of London for expediting a local bill. As soon as the report had been read in the House, it was moved that the Speaker had been guilty of a high crime and misdemeanour. He had himself to stand up and put the question. There was a loud cry of 'Aye.' He called on the 'Noes.' Scarcely a voice was heard. He was forced to declare that the 'Ayes' had it. Even his 'callous heart and brazen forehead' were unable to stand the unspeakable ignominy of his position. Had he returned to the House on the following day, he would have had to put the question on a motion for his own expulsion; he pleaded illness, and shut himself up in his bedroom. A few days afterwards, he was formally expelled. He still, however, retained the Mastership of the Rolls, 'to the great encouragement,' says North, 'of prudent bribery for ever after.' 'His profligacy and insolence united,' says Macaulay, 'had been too much even for the angelic temper of Tillotson, who had been heard to mutter something about a knave as the Speaker passed him.' There are anecdotes of him in Noble's continuation of Granger's *Biographical History*, vol. i. p. 172. He died 20th May 1717, and was buried in the Rolls' Chapel.

TRI'ADS (in Chemistry). Until recently, the terms *equivalent number* and *atomic weight* were usually regarded by chemists as synonymous. Many recent writers, amongst whom Laurent (see his *Chemical Method*, translated by the Cavendish Society) stands pre-eminent, have, however, shewn that there is an essential difference between them; and this difference is fully recognised by Professor Miller, who, in the latest edition of his *Chemical Physics*, 1863, thus defines it: 'The equivalent or combining proportion is an experimental constant which is independent of theoretical considerations; but the relative atomic weight is necessarily a matter of inference, and may be a number, often a multiple of the equivalent, and selected by the chemist from theoretical considerations, which, being based partly upon the law of gaseous volumes, partly on chemical grounds, partly on the phenomena of specific heat, seem to require that the atomic weights of a large number of the elements, if compared with the atomic weight of hydrogen, should be double of those commonly given.'—P. 22. Most chemists of the modern school now agree in arranging the elementary bodies in four groups; namely, 1. *Monad* or *Uniequivalent* Elements (or *Monads*), one atom of which in combination is equivalent to H_1, or one atom of hydrogen. In these, the atomic and equivalent numbers are identical. They are twelve in number, and include hydrogen, chlorine, bromine, iodine, silver, &c. 2. *Dyad*, or *Biequivalent* Elements (or *Dyads*), each atom of which, in combining with other bodies, is equivalent to H_2, or two atoms of hydrogen. In these, the atomic number is double the equivalent number. This group embraces twenty-five elements, including oxygen, sulphur, selenium, iron, zinc, &c. 3 *Triad* or *Terequivalent* Equivalents (or *Triads*), each atom of which, in combining with other bodies, is equivalent to H_3, or three atoms of hydrogen. In this group, which embraces nine elements, including nitrogen, phosphorus, arsenic, &c., the atomic and equivalent numbers are regarded as identical, except in the case of aluminum and rhodium, when the atomic number is doubled. 4. *Tetrad* or *Quadrequivalent* Elements (*Tetrads*), each of which, in combining with other bodies, represents H_4, or four atoms of hydrogen. Their atomic number is double the equivalent number They are eight in number, including carbon, silicon, tin, &c.

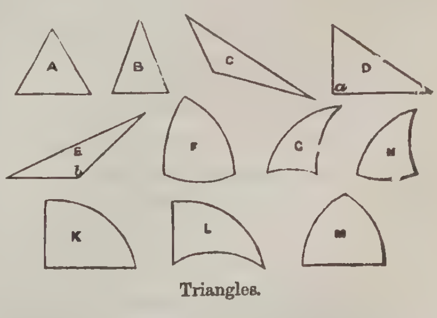
This arrangement of the chemical elements, which is being adopted in all the most recent text-books, has led to the insertion of what are termed *dashed symbols*, in which the number of dashes which are attached to the symbol for the atom of an element indicates its equivalency or interchangeable value for hydrogen. Thus, Ag is marked with a single dash, to show that silver is a monad, or, in other words, that the atom of silver may be substituted for an atom of hydrogen, so as to combine with an atom of chlorine, the resulting compound being $Ag'Cl$ (chloride of silver); Cu is marked with two, Bi with three, and Si with four dashes, to indicate that they are dyads, triads, and tetrads respectively, or that the atoms of copper, bismuth, and silicon may be substituted for two, three, and four atoms respectively of hydrogen, so as to combine with two, three, and four atoms of chlorine, forming $Cu''Cl_2$ (chloride of copper), $Bi'''Cl_3$ (chloride of bismuth), and $Si''''\ Cl_4$, or $Si^{(iv)}Cl_4$ (chloride of silicon). The terms mono-, di-, tri-, and tetratomic are also employed.

TRIAL, as a Legal term, applies most frequently to trial by Jury (q.v.), whether in a civil or criminal matter. See PROSECUTOR.

TRIAL AT BAR is a jury trial which takes place before the full court of four judges, instead of one judge only. It is seldom resorted to, and leave must be given in each case on special grounds.

TRI'ANGLE (*tres*, three, *angulus*, a corner), the most simple of geometrical figures, is a figure having three angles; but, oddly enough, it is generally defined by geometers as a figure of three sides, and its property of being three-angled is put in the subordinate position of a necessary consequence. It may be that this arises from Euclid's use of the word *tripleuron* (three-sided) in the definitions *prefixed* to his *Elements*; while *trigōnon* (three-angled) is employed in the work itself.

In plane geometry, a triangle is bounded by three straight lines; and triangles are classed according to the relative length of their sides, into *equilateral* (A),



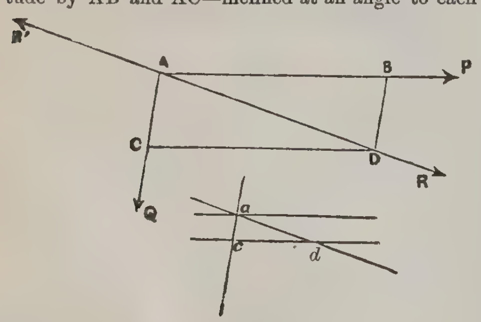
Triangles.

or equal-sided; *isosceles* (B), or having two sides equal; and *scalene* (C), or unequal-sided, the equality or inequality of the sides carrying with it the equality or similar inequality (of *greater* or *less*) of the angles respectively opposite to these sides, though the *ratio* of inequality of the sides by no means corre-

sponds to that of the angles. Considered with reference to the size of its angles, a triangle is *right-angled* (D) when one of its angles (a) is a right angle (90°); *obtuse-angled* (E), when it has one angle (b) greater than a right angle; and *acute-angled* (A or B), when it has no angle so great as a right angle; the well-known property, that the sum of the angles of a triangle is equal to two right angles, preventing the possibility of more than one of them being as great as a right angle. For the relations between the sides and angles of a triangle, see TRIGONOMETRY. The triangle being the fundamental figure of plane geometry, through which the properties of all other figures have been arrived at, the investigation of its properties has always been held to be of primary importance. Of the immense number of results obtained by investigation, we can notice only two or three in this place. The lines joining the angles of a triangle with the points of bisection of the opposite sides, intersect at the same point, as also do the perpendiculars from the angles on the opposite sides, the lines bisecting the angles, and the perpendiculars from the middle points of the sides. The point of intersection of the first series of lines is the centre of gravity of the triangle; those of the third and fourth series are the centres of two circles, the former of which touches the sides internally, and the latter passes through its three angular points. Another remarkable property of triangles, known as Napoleon's problem, is as follows: if on any triangle three equilateral triangles be described, and the centres of gravity of these three be joined, the triangle thus formed is equilateral, and has its centre of gravity coincident with that of the original triangle. See also TRIGONOMETRY and HYPOTHENUSE. The area of a triangle is half of that of a parallelogram which has the same base and altitude, and is thus equal to half the product of the base into the altitude; it may also be expressed by the formula $\sqrt{S(S-a)(S-b)(S-c)}$, where a, b, c, are the lengths of the sides, and S is half their sum.

In the geometry of the sphere, a triangle is a figure bounded by three arcs of circles (as F, G, H, K, L, and M).

TRIANGLE OF FORCES, in Mechanics, is the name given to a proposition which is merely a formal modification of the *Parallelogram of Forces* (q. v.), and as generally stated, is its converse. The parallelogram of forces enunciates that, if two forces, P and Q (fig.)—represented in direction and magnitude by AB and AC—inclined at an angle to each



other, act on a point A, their resultant, R, is represented in direction and magnitude by the diagonal, AD, of the parallelogram formed on the two lines AB and AC. Now, as the resultant, R, is equivalent to the combined action of P and Q, it would exactly counterbalance them if acting in the opposite direction AR′, but would still be fully represented by the diagonal line AD, taken as from D to A. Also, instead of AB, CD may be taken to represent P. Hence as the sides of the triangle ACD completely represent the three forces, we have the proposition, *that if three forces in the same plane be in equilibrium on a particle, and if in that plane any three mutually intersecting lines be drawn parallel to the directions of the forces, the lengths of the sides of the triangle thus formed will be proportional to the magnitudes of the forces.* Its proof rests upon the previously ascertained fact, that R′, P, and Q, three equilibrating forces at A, are proportional to AD, CD, AC, and on the geometrical theorem, that a triangle whose sides are respectively parallel to those of another triangle, has its sides proportional to those of the latter; and consequently, the ratio and relative direction of the forces R, P, and Q, are fully represented by *ad*, *cd*, and *ac*, the sides of the triangle *acd*. Again, as the sides of a triangle are to one another as the sines of the opposite angles, so also are the forces which the sides represent. Hence

P : Q : R′ : : CD : AC : AD
: : sin. CAD : sin. ADC : sin. ACD

(and substituting the sines of the supplementary angles) : : sin. QAR′ : sin. PAR′ : sin. PAQ; that is, each force is proportional to the sine of the angle between the directions of the other two.

TRIA′NGULAR NUMBERS. See FIGURATE NUMBERS.

TRIANGULA′TION is the operation of dividing any portion of the earth's surface into triangles of as large a size as possible, which may be called primary, and which must be afterwards subdivided into triangles of a smaller size, forming a great network of secondary or subsidiary triangles, which serve as a means of working down from great to less, and finally completing, by a system of scientific checks, an accurate map or delineation of the region covered by such triangles, forming the geodesical process called a trigonometrical survey. See TRIGONOMETRICAL SURVEY, ORDNANCE SURVEY. The same operation is used in the measurement of an arc of the meridian, for the purpose of ascertaining the length of a degree of latitude or longitude on any part of the earth's surface; but in this case, only primary triangles are necessary, as no topographical detail is required, and the positions of the apexes of the triangles are astronomically fixed in the most careful manner, which is not always done in the triangles of a trigonometrical survey.

In carrying out a system of triangulation, much judgment and an accurate local knowledge of a country are necessary; and it very often happens that a more extensive range of angles can be obtained from a comparatively low station, than from the tops of the highest mountains. The angles of each triangle should be as near equal as possible, and unless local circumstances render it unavoidable, very acute or obtuse angles should not be used. The sides of the primary triangles should be as long as can be conveniently observed, but in practice they vary from 80* miles or more to 4 miles, or even less. The angles are generally determined by a large theodolite, of as simple and strong a construction as possible, which is fixed on the most elevated points of mountain-ranges, &c. When the apexes of the triangles are very distant, heliostats, or mirrors reflecting the sun's rays, are often used, and in dark or cloudy weather the Drummond light has been employed. The primary triangles being fixed on the spherical surface of the earth, certain formulæ, according to the rules of spherical trigonometry,

* In the survey of India, and also in the process of connecting the triangulation of Ireland with that of Great Britain, many of the sides of the triangles greatly exceed this length.

must be applied to reduce them to the simple calculations for ascertaining, from certain known data, the sides and angles of plane triangles. The whole of those calculations are dependent on the accurate measurement of a base or fundamental line. The instruments invented by Captain Drummond, R.E., with which he measured the base line of the Irish survey at Lough Foyle, and which were afterwards employed by Sir T. Maclear in verifying Lacaille's base-line on the plains of Malmesbury, in the Cape triangulation, appear to have been as nearly perfect as possible. The length of base-lines used in modern surveys varies from 3 to 7 miles; General Roy's original base-line of the English survey was 5·19 miles.

At the end of a large triangulation, a second or testing base-line is always measured at a distance from the original one; if the measured length of this agrees with that ascertained by calculation, it may be considered a proof of the accuracy of the work in general. In the survey of Great Britain by Mudge and Colby, bases of verification were measured for at least every 200 miles, except in Scotland, where only one was measured near Aberdeen.

The triangles of the English survey have been extended to and connected with those of France, Russia, &c., as far east as Siberia, and south to Algeria; and it is not at all improbable that the triangles of the Russian survey will eventually be connected at one side with those of the great survey of India, which already has the apexes of many of its triangles on the summits of the Tibetan Himalaya, and to the eastward across Behring's Strait, with those of British America and the United States.—See Yolland's *Account of the Measurement of the Base of Lough Foyle* (Lond., Longmans, 1847); Colonel Portlock's *Life of Colby;* and art. 'Celestial Measurings and Weighings,' by Sir John Herschel, *Good Words* (1864).

TRI'AS, the oldest group of the Secondary strata, formerly associated with the Permian rocks under the name of the New Red Sandstone (q. v.). The term Trias, or the Triple Group, has been given to these beds by German geologists because they are separable into three distinct formations: the Keuper, Muschelkalk, and Bunter-sandstein; and the name has been generally adopted, as the beds are more fully developed in Germany than in England or France.

The typical beds are divided into—1. Keuper (q. v.), with a maximum thickness of 1000 feet; 2. Muschelkalk (q. v.), with a maximum thickness of 600 feet; 3. Bunter Sandstein (q. v.), with a maximum thickness of 1500 feet.

In England, the principal Triassic deposit occurs in a great basin of the palæozoic strata in Lancashire, Cheshire, Shropshire, Staffordshire, and Leicestershire. The eastern base of the great central Pennine range of hills is composed of Triassic beds, which, beginning in Leicestershire, run northwards through Nottingham and York to the coast of Durham. From Staffordshire, another series of these beds may be traced along the valley of the Severn, and crossing the Bristol Channel, through Somerset and Devon, to the southern coast.

Triassic beds extend from Massachusetts to South Carolina, and abound in China, India, Australia, &c.

TRIBE (Lat. *tribus*, a division, originally perhaps a third part, in reference to the three cantons whose coalescence formed the germ of Rome, q. v.), an aggregate of stocks—a stock being an aggregate of persons considered to be kindred—or an aggregate of families, forming a community usually under the government of a chief. The chief is possessed of despotic power over the members of the tribe. It is commonly said that he has 'patriarchal' power—such power, that is, as fathers in early times exercised over their children. The tribe has been the earliest form of the community among all the races of men.

In a very large proportion of existing tribes, the tribe is an aggregate of several stocks or distinct bodies of kindred. The persons of whom the tribe consists are included in stocks which are, or are accounted, distinct from each other. This organisation is sustained by two tribal customs—(1) persons of the same stock are forbidden to intermarry; and (2) kinship is reckoned through females only, so that children are accounted of the stock of their mother. Persons of the same stock, too, owe duties to each other, and are to some extent sharers in each other's liabilities. Thus, an injury done by a man is an injury done by his stock, which may be avenged upon any member of it; an injury done to a man is an injury done to his stock, for which every member of it is bound to seek vengeance. In consequence of the customs above mentioned, a husband must be of a different stock from his wife or wives; he must therefore be accounted of a different stock from his children; and when he has wives of different stocks, their respective children are accounted of different stocks. More than one stock is thus represented in every household; and since a man owes duties to his stock—the duties of acknowledged blood-relationship—while to those of his family who are not of his stock, nothing but the accident of birth (only accident) unites him, the family among these tribes has necessarily little cohesion. The tribal customs which have been referred to, ignore the family altogether; they are founded upon the idea of stock. They are the customs of people with whom the conception of stock was a powerful social influence, when that of the family was impotent—of people who must have been divided into stocks at a time when, possibly, they had *no* family system. It is inconceivable that such customs should have arisen in the face of a family system anything like that which prevails among civilised peoples, or even of such an approach to the family as many of those tribes now possess. And it follows that the family has *grown* among these tribes. It is obviously now growing among them. Now, in many cases, the only obstacle to its rapid development is the firm hold which the idea of stock has taken of the tribal life. On the other hand, the prevalence of customs founded upon the idea of stock proves a prior existence of stocks, or bodies of kindred. The separation into stocks must be older than the customs, at least as customs associated with the idea of stock. And keeping this in view, and considering how difficult it is to conceive of several stocks herding together at the early time when every stranger was an enemy, unless there was some natural connection between them—such a connection as the marriage-law and the system of kinship, when they arose, would establish—it may safely be concluded that each stock was originally a separate tribe. Into the tribe conceived of as a single stock, the marriage-law and system of kinship would gradually bring a variety of neighbouring stocks; and thus the tribe would become what it is—an aggregate of stocks. The progress of such tribes appears to have been from the tribe conceived of as a group of kindred to the tribe consisting of several stocks or groups of kindred; and now, though the family is not yet fully developed among them, they seem to be tending to become aggregates of families. The tribes of

Australasia are the most perfect examples of the organisation above described; but it also exists (or it existed) among the tribes of North, and most of those of South America, among a majority of the known tribes of Africa, and a large proportion of the ruder tribes of Asia.

Suppose male kinship (which must come with the growth of the family) introduced among tribes such as have been spoken of, containing different stocks. First, the stocks existing within the tribe would be fixed, stereotyped, within it; second, the growth of the family would be greatly promoted, and the influence of the idea of stock proportionately diminished. The family would in time rise to the importance originally possessed by the stock; and at length the tribe, still divided into stocks, would become, politically, an aggregate of families. The tribe would thus assume the exact shape which it had in the early ages of Greece and Italy, when it was an aggregate of families included in clans or bodies considered kindred (*gentes*); the exact shape which it now has among the most advanced of existing tribes. Since a tribe of the Australian type might thus develop into a tribe of the classical type, is it not probable that the latter really was the result of such a process of development? Regarded as a hypothesis, this view will be found to fulfil all the conditions of a good hypothesis. And if the circumstances of tribes which have what is popularly termed the marriage law of caste—among the greatest of which a division corresponding to the Roman *gens* prevails—can be reconciled with it, or with an extension of it, we shall have got a hypothesis capable of explaining the formation of tribes in general. The tribes above referred to, whether divided into clans or not, consider themselves of a common stock. They restrict marriage to the stock; but they always forbid marriages within certain degrees of relationship; and in numerous cases—among them, those of the most numerous caste peoples — they also forbid marriage within the clan or body considered peculiarly kindred. It will be convenient, for want of a better word, to speak of this marriage law as caste. And by caste tribes, in what follows, are to be understood tribes which have this marriage law.

Seeing that the law forbidding marriage within the tribe, and the law restricting marriage to the tribe, have both been widely prevalent among human races, both must be conventional, produced by circumstances; and if in their origin they are equally ancient, men, at the first, in respect of their circumstances, must long have been divided into two bodies very differently placed. This, however, is very improbable. There is no evidence for it; there is some evidence against it. The circumstances, too, capable of producing caste must have been isolating circumstances. The effect of an isolated position in producing an approach to caste may be seen in the case of the royal houses of Europe. Excepting, perhaps, mere physical isolation, it is difficult to conceive of isolating circumstances which could operate in the earliest times. Those which can be conceived of, and which are also known to have operated among caste peoples—the pride of conquerors, peculiarities of religion, the sentiment of an aristocracy or a priesthood, hereditary occupations—could only exist when society is somewhat advanced. It thus becomes highly probable that caste did not prevail in the earliest times—was not the original law of any tribes. There is strong corroboration of this in the fact, that it is found imperfectly established—in course of being established—among not a few existing tribes; and in the fact, that it became the law of peoples—for example, the Hebrews—whose ancestors, according to tradition, followed a different practice. In connection with these considerations, there is conclusive reason for holding that caste was not an original law, in the law of incest which prevails among the greatest of caste peoples, by which marriage is forbidden, not only within certain degrees of relationship, but also within the clan or body of kindred denoted by a family name. The existence of any law of incest among a caste people requires explanation. But how could a prohibition of marriage within the clan arise among people whose principle it was to marry within the kindred? This can only be referred to circumstances which preceded the origin of caste. Does it not, then, suggest the establishment, through the force of isolating circumstances, of caste—the restriction of marriage to the tribe, or to particular tribes—among tribes divided into stocks which had forbidden marriage within the stock? This would, at any rate, account for the facts. The original prohibition, upon this view, is still represented by the prohibition of marriage within the clan. But as tribes advanced, the family usurped the place of the stock; there sprung up a belief in the common origin of the tribe; and the law of succession to family property gave a new importance to near relationships. The law of incest would naturally tend to follow the practically important limits of relationship; and it might, being still applicable to the stock, be held specially binding within those limits; or it might be confined to them, for in the case of small and simply-constituted bodies, within which the differences of condition and of employment were few and slight, the stocks—pressed, on the one hand, by the growth of the family, on the other, by the growing belief in the common descent of the tribe—would be apt to disappear altogether. The absence of the stock or clan in the case of some of the smaller caste tribes, and the two laws of incest found among caste peoples—one of which, at least, seems otherwise inexplicable—can thus be accounted for consistently with the hypothesis of such peoples having progressed from the organisation of the Australian tribe. And it having been shewn that caste is not an original law, all other circumstances of caste tribes will be found consistent with that hypothesis. The belief which many tribes have had in their descent from one progenitor, is not corroborated in any case. It cannot prove its own truth. In many cases, it can be shewn to be a fiction; it is presumably so in all cases, and it does not afford an argument for or against any theory of the origin of tribes.

The hypothesis of development, as it may be called, is thus capable of connecting together all the varieties of the tribe, the simplest with the most advanced; and it gives us, as the earliest and simplest idea formed of the tribe, that it was a body of persons who conceived themselves to be of a common stock. It is in the favour of this hypothesis that it affords an easy and natural explanation of the peaceable political union and fusion into one people of neighbouring tribes; and of the fact, that a population is divided into a greater or less number of tribes, according as it is less or more advanced. Neighbouring tribes would contain the same stocks; they would thus be really homogeneous, and related; they would be ready for union as soon as their circumstances brought them into close contact, and made a political union desirable.

There are facts and arguments by which this hypothesis may be raised to so high a degree of probability, that its soundness can scarcely be doubted. A single example of them must suffice.

It is the received opinion that among the advanced tribes containing gentes, property was originally vested in the gens, and was only by slow degrees wrested from it by the family. It is involved in this, that at one time the gens was everything, the family nothing, in the organisation of the tribe; that the latter grew, and that as it grew, the former sunk in importance. The tribe, when property was exclusively vested in its gentes, must have been an aggregate of gentes, not an aggregate of families. All this is consistent with, and corroboratory of, the hypothesis of development; in particular, it strongly corroborates the view that the tribe at an early period consisted of several bodies of kindred, accounted distinct from each other, and each of which held property in common. It has never been accounted for upon any other view.

The only other theory which has been formed of the origin of tribes—commonly called the patriarchal theory—is, that a tribe consists in the main of the descendants of a single family, descent being chiefly, if not exclusively, reckoned through males; and that the gentes found within the tribe consist of the descendants of individual sons or grandsons of the common progenitor. It is evident that this theory does not explain the organisation of the numerous class of tribes first considered. It has been formed upon observation of the advanced tribes of the classical type, but it does not consist with the history of property (to test it at a single, but a vital point) even among them. It might account for property being vested in the tribe; it does not account for it being vested in the gentes. It can only do so by the aid of the assumption that, though the sons and grandsons of the original progenitor had the desire for family property, and divided his property, or accumulated property of their own, their descendants suddenly lost that desire, and began to hold in common. But such a supposition is too improbable to be entertained. This theory is also excluded in the case of all polyandrous peoples, for it assumes that society began with monandric marriage, a perfect idea of the family and male kinship—all conditions the very opposite of those which must at one time have prevailed among such peoples. And polyandry can be shewn to have prevailed so widely, that it is probable it has been the earliest practice of every human tribe. However this may be, a theory which is contradicted by a great proportion—much the greatest number—of the cases to be accounted for, and is in important respects not consistent with any class of cases, cannot be a good hypothesis; and therefore the patriarchal theory has no title to be accepted as explaining the normal history of the formation of tribes, or of any class of tribes. Its fundamental assumption, indeed—the segregation of individuals who became progenitors of tribes—seems to be at variance with the nature of man, which all experience has shewn to be social and gregarious, and to be the most averse to separate and independent action, when society is the least advanced. It should also be stated that it fails to do what a sound theory of tribal formation must do—to account for the fusion of neighbouring tribes, independently of conquest, into one people. To account for this, it has been customary to suppose that neighbouring tribes, wishing to unite, adopted one another; but there is no evidence of such adoption having ever been practised, and the supposition seems entirely improbable.

The patriarchal theory was, until recently, the received account of the formation of tribes. The theory which has here been styled the hypothesis of development was first propounded, though without elaboration, in a work published in 1865, *Primitive Marriage*, by J. F. M'Lennan.

TRIBONIA'NUS, a very eminent Roman jurist of the 6th c., of Macedonian parentage, but born in Pamphylia. He held, under the Emperor Justinian, the offices of quæstor, master of the imperial household, and consul. But he is famous chiefly through his labours in connection with the Code (q. v.) of Justinian (q. v.) and the Pandects (q. v.) T. died in 545.

TRI'BUNE. See ROME.

TRI'CHECUS. See MORSE.

TRICHI'ASIS (Gr. *thrix*, gen. *trichos*, of a hair) consists in a growing inwards of the eyelashes; three or four of them (sometimes only one) presenting their points towards the globe of the eye, while all the other hairs retain their natural position. The disease is exceedingly common among the lower classes, and especially the Irish. This affection causes great annoyance, by exciting a pricking sensation, and by the constantly irritable and watery state of the eye which it induces. The treatment consists in plucking out the offending hairs (if they are few in number) from time to time, each hair being removed by hair-forceps with a slow steady pull. If they form a little group, they must be removed by dissecting out the small portion of lid in which they are implanted, and uniting the wound with a suture. In other cases, it may be necessary to remove the entire margin of the lid.

TRI'CHINA SPIRA'LIS is the larva of a nematoid or thread-like parasitic worm recently recognised in its adult state. It was first detected as a pork-parasite by Professor Leidy of Philadelphia. In 1835, Mr Wormald, then Demonstrator of Anatomy at St Bartholomew's, gave to Professor Owen four microscopical specimens of speckled muscle from a subject that was then in the dissecting-rooms; and Mr Paget subsequently investigated the question. Professor Owen, to whom the discovery of the trichina is generally referred, soon afterwards communicated to the Zoological Society his 'Description of a Microscopic Entozoon infesting the Muscles of the Human Body,' in which he describes the speckles as capsules containing a spirally-coiled microscopic worm, to which he gave the generic name trichina (Gr. *thrix*, a hair), and the specific name *spiralis*, from its coiled arrangement. Mr Paget had independently arrived at similar results, with the aid of Robert Brown of the British Museum, and read a paper on the subject to the Abernethian Society a week before Professor Owen's memoir was read to the Zoological Society; so that his name should always be *at least* associated with that of Owen in reference to the discovery of this worm. From the date of this discovery to the present time, the *trichina* has been a fertile source of discussion. In 1845, the idea was mooted by various naturalists that the trichina was the undeveloped or sexless form of some other worm; and in 1855 (after the transformation of the cysticercus into the tapeworm was discovered), various suggestions were made on this subject; but it was not till 1860 that Virchow and Leuckart, by feeding animals on flesh containing trichinæ, arrived independently at the correct conclusion, that the parents of the encysted trichinæ are small nematoid worms, which had never previously been described, Leuckart's experiments being made with human flesh containing these parasites.

The young trichinæ, as they are seen in the human muscle, present the form of spirally-coiled worms, in the interior of small, globular, oval, or lemon-shaped cysts, which appear as minute specks

scarcely visible to the naked eye. These cysts are more or less covered externally with calcareous matter, according to the length of time they have remained in a fixed position, and the degree of degeneration which their walls have undergone. The trichina measures, according to Cobbold, on an average $\frac{1}{78}$th of an inch in length, and $\frac{1}{130}$th of an inch in breadth. The cysts are sometimes altogether absent, and hence they must be regarded as abnormal formations, resulting from local inflammation set up by the presence of the worm, which in this larval condition of existence measures $\frac{1}{25}$th of an inch in length, and $\frac{1}{630}$th of an inch in breadth. These larval worms exhibit a well-marked digestive apparatus, and afford evidence of the presence of reproductive organs, which are often sufficiently developed to enable the observer to determine the sex of the organism. The number of larval trichinæ that may simultaneously exist in the muscles of a single man or animal is enormous. In a cat on which Leuckart experimented, a single ounce of flesh was estimated to contain 325,000 trichinæ; and if all the voluntary muscles of a human body of ordinary size were similarly affected, the number of worms would exceed 1950 millions! Dr Cobbold believes that there can be no doubt that the number in a single 'bearer' (as he terms the sufferer) may *actually* amount to at least 20,000,000.

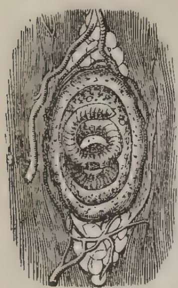


Fig. 1.

The worm lying coiled up in muscle, the outside of the cyst supporting fatty tissue, vessels, &c. (magnified).

We now proceed to the consideration of the mature worms. When an animal is fed with flesh containing the larval worm already described, and is killed a few days afterwards, a large number of minute worms are found mixed with the contents of the small intestines. On closer examination, they are found to be of two kinds—the larger and commoner one being the female, and the smaller and rarer one the male. At the second day after their introduction, these intestinal trichinæ attain their full sexual maturity; and in six days, the females contain perfectly developed and free embryos in their interior.

The female is a slender round worm, varying in length from $\frac{1}{12}$th to $\frac{1}{5}$th of an inch. The anterior end presents a bead-like appearance, from which the intestinal canal proceeds. The posterior three-fourths are mainly occupied by the reproductive organ, which is filled partly with free embryos, and partly with eggs in various stages of maturity. When these embryos have attained their full size within the uterus of the parent, they pass out at the genital aperture, and commence life on their own account. The accompanying diagram shews these embryos (highly magnified) in various stages of development. They are little worms with rounded ends, and presenting no indications of any internal organs. Before entering into the history of their migrations, we may mention that the male worm is seldom more than two-thirds the length of the female. It presents the same bead-like arrangements as the female, and a reproductive organ whose aperture apparently coincides with the anus; while the female sexual aperture is comparatively near the head-end of the worm. The body terminates with two hooks (of which only one is seen in the figure), which are doubtless subsidiary to the reproductive process. The males are less numerous and shorter lived than the females, and probably die after having discharged their natural function. The females continue bringing forth young for a period of two or three weeks. The embryos, according to Leuckart, Cobbold, and all our best helminthologists, penetrate the walls of the intestine, and pass directly into the muscles of their 'bearers' or 'hosts,' where, if the conditions are otherwise favourable, they are developed into the form originally observed by Owen and Paget. In this way, by proceeding along the course of the intermuscular connective tissue, some of them reach the muscles of the extremities and other distant parts; but the majority of the wandering embryos (according to Virchow) 'remain in those sheathed muscular groups which are nearest to the cavity of the body (abdomen and thorax), especially in those which are smaller and most supplied with connective tissue.' These embryos penetrate into the interior of the separate muscular bundles, and in the course of 14 days acquire the size and organisation of *Trichina spiralis*. The surrounding tissues soon become disorganised, and the spot inhabited by the coiled-up worm is converted into a spindle-shaped widening, within which the previously described cyst is formed by a hardening and calcification of the exterior. A point of great importance in relation to the distribution of this parasite, and as having a practical bearing upon the disease known as *Trichiniasis* (q. v.)

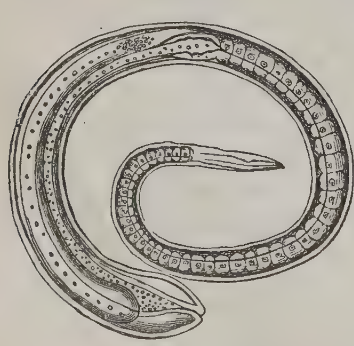


Fig. 2.

Sexually mature female *Trichina spiralis* (highly magnified).

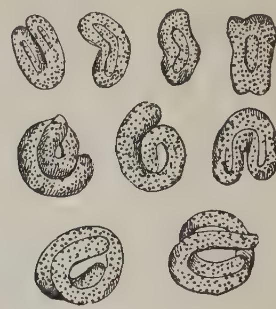


Fig. 3.

Fig. 4.

Sexually mature male *Trichina spiralis* (highly magnified).

has been established by the experiments of Davaine —viz., that while in the adult condition, trichinæ perish in cold water in about an hour, and cannot survive the decease of their host for more than six hours, the larvæ remain alive in water for a month, and will live for a long time in flesh which has become putrid. In this way, 'a carcass near a marsh or rivulet may communicate the parasites to the ruminants that drink the water, or to pigs.'

In the same year (1860) in which Virchow and Leuckart proved, that by feeding an animal on flesh containing the *Trichina spiralis*, intestinal trichinæ were produced, and watched the transformation of the young of the latter into muscular trichinæ, a very important corroborative medical case was observed, and recorded by Zenker. In this case (which occurred in the Dresden Hospital in January 1860), the patient was a servant-girl, aged 20, and the principal symptoms were loss of appetite, prostration, violent pains and contraction of the limbs, and finally œdema, which, with a certain amount of pneumonia, terminated fatally in the course of a month. After death, numerous larval trichinæ were found in her muscles, while the intestinal canal contained sexually mature worms. The girl was taken ill on January 12; and three weeks previously, she had assisted in killing pigs and making sausages. It was further ascertained that, a few days before her illness commenced, she had eaten some of the meat in a raw state. On examination, it was found that the pork (both hams and sausages) contained numerous encysted trichinæ. It was, moreover, ascertained that the butcher and several members of the girl's family (to whom she had probably given sausages) were attacked with symptoms similar to those which, in her case, proved fatal. How the pig acquires its trichinæ is unknown. Beet-root, earthworms, moles, and rats have been suggested as their infectors; but on this subject see the advice given by the French commissioners in the next article. Nothing definite is known as to how widely trichinæ are diffused through the animal creation. The adult trichina is liable to infest the intestinal canal of all animals in which the larvæ have been found in the muscles. In this category must be placed man, the dog, cat, rabbit, rat, mouse, mole, hedgehog, and badger. Whether birds ever contain trichinæ is doubtful, and reptiles and fishes are quite free from this parasite.

TRICHINIASIS is the name of the diseased condition which is induced by the ingestion of food containing *Trichina spiralis* in large quantity. The first recorded case, as occurring in the human subject, is that of Zenker, which has been already noticed in the article TRICHINA; but there can be no doubt that the disease has long existed, although its origin was previously unsuspected.

The first symptoms of this disease, as it occurs in the human subject, are loss of appetite, followed by nausea and a sense of fatigue, prostration, and general indisposition. This stage lasts about a week. Pain and stiffness of the limbs, accompanied by swelling of the face, and fever of a peculiar type, characterised by a very frequent pulse, moderate thirst, and copious perspirations, now shew themselves; the commencement of the second stage of the disease being thus synchronous with the migration of the trichina-brood into the muscles. During this stage, pressure, or any attempt to move the parts under the control of the swollen muscles, is intensely painful, and even the normal respiratory movements cause such constant pain as to render sleep impossible. In severe cases, the patient lies on his back like a paralysed person. The tongue presents much the same appearance as in ordinary gastric fever. The bowels are most commonly constipated, but in some of the worst cases, there is continuous diarrhœa. The swelling which began in the face now disappears, and is replaced by swelling of the feet, which gradually rises to the trunk. In about the fourth week of the disease, the trichinæ may be regarded as permanently settled, and as having completed their destructive action on the muscles. This is the beginning of the third stage, which is mainly characterised by extreme weakness. The gastric symptoms abate, the appetite returns, and, in favourable cases, the muscular pains and swelling gradually diminish, while, in severe cases, this third stage is the most dangerous part of the disease; the diarrhœa being severe, and accompanied with tenesmus, and often with the involuntary discharges of the fæces and urine, while the skin exhibits extreme pallor, and is enormously distended with effused serum. Moreover, pneumonia often supervenes at this period. The fourth and last stage is that of convalescence. This may begin at the fifth week, or later, and may last from three weeks to as many months. In mild cases, it is impossible to draw a definite line between this and the preceding stage. Death may occur at any period. It has been observed as early as the 5th, and as late as the 42d day of the disease. A single trichinous pig, if its flesh is eaten without being previously submitted to such culinary processes as to destroy the vitality of the larval trichinæ, may establish a local epidemic of this disease. The most important of those epidemics have occurred in Germany, and are noticed by a German physician, Dr Thudichum, in 'The Seventh Report of the Medical Officer of the Privy Council,' 1865. Of these, the second or great epidemic at Hettstädt was the most severe. It commenced in the second half of October 1863, and affected 158 persons, of whom 28 died. All these persons were found to have been eating trichinous pork, either perfectly raw, or in the form of smoked or fried sausage, meat-balls, brawn, black-pudding, &c.

As soon as a case of suspected trichiniasis comes under the notice of the physician, attempts should be made to remove the mature worms from the intestine by active purgation. For this purpose, calomel, in scruple doses, is more serviceable than any other purgative. Two or three such doses should be given at intervals of 24 hours. No special directions can be given for the treatment of the fever. If there is any appetite, the diet should be light, and at the same time nourishing. Liebig's Extract of Meat has been found very serviceable in keeping up the strength. The most effectual remedy for the sleeplessness was found to be the cold wet sheet, in which the patient should be wrapped repeatedly during the day. The preparations of opium only aggravate the discomfort. The other symptoms must be treated by the ordinary rules of therapeutics.

Considering the gravity of this disease, it would be of the greatest importance to be able to decide, during its life, whether a pig were trichinous or not. On this point there is some difference of opinion; but Professors Delpech and Reynal, who were charged by the French government to report upon this disease, assert that 'the animal, while living, shews no signs of the presence of trichinæ, nor can they be detected in the meat with an ordinary lens, but a powerful microscope renders them at once visible.' In Hanover, out of 25,000 pigs, 11 were found trichinous; in Brunswick, 16 were affected out of 14,000; while in Blakenburg, 4 were diseased out of 700. The French commissioners assert that a temperature of 167° F. is sufficient to kill the parasites, and that meat thoroughly salted is also perfectly

safe; they advise that smoke-dried sausages, though probably safe, should be well boiled. They further attribute the spread of the disease among pigs to the fact that they are foul feeders, and will eat any offal, such as the dead bodies of rats and other animals, which are known to be liable to the disease. They recommend farmers to be very cautious in feeding their pigs to avoid giving them flesh without first boiling it; to destroy rats and small carnivorous animals, and never to leave human or other excrements in places where pigs can reach them. Finally, they advise all experimenters to burn trichinous flesh when their investigation is completed, and not to throw it away; for a fragment of it might possibly be eaten by a rat, the rat devoured by a pig, and the pig thus become the medium of the disease to man. This utter destruction of the parasites is a point on which Dr Cobbold has long insisted. In 1863, a trichinous pig from Valparaiso, killed on board a merchant-vessel on the high seas, caused the death of two of the crew; and in 1864, there was a slight trichinous epidemic at Cheektowaga, New York. Athough the trichina was discovered in England, and has been noticed in Scotland and Ireland, these countries and France have hitherto been free, not only from any epidemic outbreak, but from any recognised case * of the disease; nor, so far as we know, has any trichinous pig been as yet found in the above-named countries.

TRICHINO'POLY (more correctly, TRICHINAPALLI), the capital of a collectorate of British India of the same name, on the right bank of the Kaveri, 30 miles west of Tanjur. The fort, which includes the old town, stands on the rugged slope of a steep granite rock, 500 feet in height, which from some points resembles Edinburgh Castle. The walls of the fort, recently demolished, had a circuit of two miles, and this area is inhabited by a dense population, dwelling in low, closely-packed huts. The streets are tolerably regular, and are crowded at all hours of the day with multitudes of passengers, bullock-carts, and cattle. Beyond the walls is St John's Church, containing the tomb of Bishop Heber, who was buried here in 1826. The climate, during eight months of the year, is exceedingly hot, nevertheless T. is the head-quarters of the south division of the Madras army; there are several barracks, and the lines for the men and the officers' houses cover a space of ground six miles in circumference. Cheroots are manufactured here in large quantity, from excellent tobacco grown in the vicinity. Manufactures of hardware, cutlery, and jewellery, especially gold chains, harness, and saddlery, in all of which branches the natives of T. have long been famed, are extensively carried on. Pop. 30,000, exclusive of the garrison.

TRICHOCE'PHALUS (derived from the Gr. *thrix*, gen. *trichos*, a hair, and *cephale*, the head) is the name given to a genus of intestinal worms, of which one species, *T. dispar* (described by the older writers, who mistook its head for its tail, as *Trichuris* and *Ascaris trichiura*), infests the human intestinal canal. Dr Cobbold describes it as a small nematoid worm, the male measuring $1\frac{1}{2}$ inches, and the female fully 2 inches in length; it is characterised by an extremely long hair-like head and neck, occupying about two-thirds of the entire length of the body. This parasite is comparatively rare in this country, while, according to M. Davaine, not less than one-half the inhabitants of Paris are infested by it. Its presence is attended with little or no inconvenience. Its development and mode of gaining access into the body are subjects to which much attention has recently been paid, but which are by no means as yet cleared up. Davaine finds that the eggs are not developed within the host's intestines, but are discharged *per anum*, in the immature condition in which they escape from the parent; and it further appears, that after their expulsion, a period of six months must elapse before embryonic formation commences. As in the more common instance of *Ascaris lumbricoides*, it is probable that they complete their development in open water, from which they are transferred to the human stomach.

For further information on the genus *Trichocephalus* generally, we may refer the reader to Part I., chap. v. of Dr Cobbold's *Entozoa;* while the species considered in this article is fully discussed in Davaine's *Traité des Entozoaires.*

TRICHO'PTERA. See CADDICE.

TRICK, a term used in Heraldry to denote a mode of representing arms by sketching them in outline, and appending letters to express the tinctures, and sometimes numerals to indicate the repetition of changes.

TRICLI'NIUM, the apartment in a Roman house in which the meals were eaten.

TRI'COLOUR means literally no more than a flag in three colours, which is the case of almost every national ensign; but the applied sense limits it to flags having three colours in equal masses, and these are ordinarily assumed by nations which profess to have gained their 'liberty.' The present European tricolour ensigns are: France—blue, white, red—divided vertically. Italy—green, white, red—divided vertically. Belgium—black, yellow, red—divided vertically. Holland—red, white, blue—divided horizontally. The tricolour took its rise at the commencement of the French Revolution as the badge of the National Guard. The red and blue were selected as the arms of Paris, and the white was added, as the colour of the army, to shew the intimate union which should subsist between the people and the armed force.

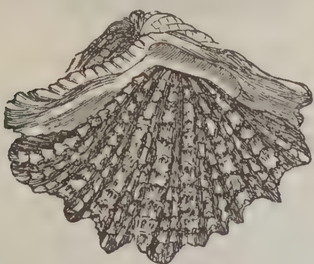
TRICOUPIS, SPIRIDION, a modern Greek statesman and author, son of a primate of Missolonghi, was born in that town in 1791. After completing his studies in France and England, he went to the Ionian Isles, where he aided Lord Guilford in the foundation of the university of Corfu (1820); but on the outbreak of the war of independence in the following year, he hastened to enrol himself among the patriots, and played an important part in the great struggle. From 1821, except during the presidence of Capo d'Istria, he was continually employed in administrative and diplomatic business. During the reign of King Otho, he was thrice sent to London (1835—1838, 1841—1843, and 1850—1855) as envoy-extraordinary; he was Minister of Foreign Affairs and of Public Instruction (1843); vice-president of the Senate (1844—1849); and envoy-extraordinary to Paris (1850) on the occasion of the blockade of the ports of Greece by England. In the grave political vicissitudes of late years, he has had his share, and in 1862 declined to form a ministry on account of ill health.

T. enjoys a great reputation in his own country as an orator and historian. His funeral oration on Lord Byron (whose friend and comrade he had been), delivered in the cathedral of Missolonghi, some days after the poet's death, has been translated into most European languages. Many other orations, partly religious and partly political, spoken

* In 1835, Mr Wood of Bristol published, in the *Medical Gazette*, a case of acute rheumatism, accompanied by pneumonia, in which trichinæ were discovered after death. No one can read the case without being struck by the idea that Wood *all but* anticipated Zenker in discovering a new disease.

by T. in the course of the revolution, have been collected and published (Paris, 1836). Besides these, we must mention a martial poem on the Klephts (*Poiēma Klephtikon*, Par. 1820); but his masterpiece is his History of the Greek Revolution (*Historia tes Hellēnikēs Epanastaseos*, Lond. 1853—1854), a work which is praised for its accuracy, impartiality, and style.—*Dictionnaire des Contemporains.*

TRIDA′CNIDÆ, a family of lamellibranchiate molluscs, having the shell open, the valves equal, the foot small, and furnished with a byssus. *Hippovus maculatus*, the BEAR'S-PAW CLAM (q. v.), is



Tridacna gigas.

prized for its beauty. *Tridacna gigas* is remarkable for its great size, exceeding that of any other bivalve. The shell of a single specimen has been known to weigh more than 500 lbs. The valves are sometimes used in Roman Catholic churches for holy-water vessels. They are also used as an ornament for grottoes and fountains. They are deeply furrowed and beautifully grooved. This great mollusc is a native of the East Indies, and is found in shallow water. It is used for food, and one suffices for a number of persons.

TRI′DENT, in Classic Mythology, is used as the symbol of Neptune's sovereignty over the sea. It consisted of a staff, armed at one end with three short prongs, with double barbs at the points, resembling the *fuscina* used by the Italians in catching large fish, particularly the sword-fish, from which we may perhaps infer that Neptunus was originally the god of fishermen. It was customary among the Grecian states to place the figures of their patron deities, or their appropriate symbols, on coins; hence, we frequently meet with the trident on ancient coins, such as those of Saguntum, &c.; likewise on the Sicilian coins of Hiero, &c.

TRIE′NNIAL PRESCRIPTION, in the Law of Scotland, is a limit of three years imposed on all creditors to bring their actions to recover a certain class of debts and damages—such as actions to recover merchants' accounts, servants' wages, house-rents (where the lease is verbal), debts due to tradesmen, lawyers, and doctors. So actions to recover damages for wrongous imprisonment must be brought within three years.

TRIË′ST, or **TRIË′STÉ** (Slav. *Tērst*), the most important seaport of the Austrian monarchy, and the most considerable trading town on the Adriatic, stands at the head of the Gulf of Triest, an arm of the Gulf of Venice, 90 miles south-west of Laibach, on the Vienna and Triest Railway. It is an imperial free town, and attached and belonging to it is a territory 46 sq. m. in extent, consisting of the slopes of the *Triestiner Karst*, which decline somewhat abruptly toward the Adriatic shore. The city of T., in which the population of the district is almost wholly massed, the other places being only small villages, consists of the old town, the new town, or Theresienstadt, and the two suburbs, Josefstadt and Franzenstadt. The old town, built on the slope of a steep hill, surmounted by a castle, forms about a fourth of the whole city, and is distinguished by its narrow streets and black walls. It contains the cathedral, an early Byzantine edifice of uncertain date, into the walls of which stones bearing Roman inscriptions and carving have been built, and the tower of which is said to rest on the foundation of a temple of Jupiter. The new town, with broad streets built in regular parallelograms and handsome houses, occupies the plain that fronts the sea. Between these two divisions runs the *Corso*, the chief thoroughfare of the city. The *Tergesteum*, in the new town, is a splendid modern edifice, built in 1842, and containing a bazaar, a grand concert and ball room, exchange and reading rooms, and the offices of the Austrian Lloyd's, the largest establishment in Europe for sea-steamers. To the north, on the sea-shore, is the new and magnificent Lazaretto, with a harbour in which 60 vessels can perform quarantine at once. There are numerous churches for Greeks, Jews, Roman Catholics, and Protestants. The population includes Germans, Americans, Italians, Greeks, Jews, Armenians, Dalmatians, &c.; but Italian is the prevailing language. T. is a free port; and the harbour, the entrance to which is uninterrupted by islands or sandbanks, is well protected. The manufactures carried on here are very extensive. There are upwards of 40 establishments for ship-building, 3 great soap-works, and 7 rope-works. Rosoglio, white lead, and leather are manufactured, and wax-bleaching is carried on. Over 15,000 merchantmen and coasting-vessels enter the port annually. The value of the imports is about £5,500,000; that of the exports, £4,500,000. Pop. of the city in 1869 was 70,274; of the city with the surrounding district in 1880, 144,437.

T., the ancient *Tergeste* or *Tergestum*, was of importance under the Romans, and first receives historical mention 51 B. C., when it was overrun and plundered by neighbouring tribes. It was much improved by Augustus; and, in 1382, finally passed into the hands of Austria. It owes its prosperity chiefly to the Emperor Charles VI., who constituted it a free port, and to Maria Theresa. Since the year 1816, T. has borne the tile of 'The most Loyal of Town.'

TRIFLE, a supper-dish at evening entertainments. It consists of two parts. The lower is usually made of sponge-cakes, ratafias, or macaroons, soaked in sherry or Madeira, and placed in the bottom of a proper glass-dish; over these is then poured a mixture of fine boiled custard and of cream, in equal parts; and sometimes another layer of the cakes is laid, well soaked in sherry. A whip, or syllabub, is then made with sugar, cream, white of egg, and sometimes a little white wine and brandy, the froth of which, as it is formed by the whisk, is removed, and placed over the soaked cakes, and forms the second part of light froth of the trifle. Almost every cook has some variation in the manufacture of this dish.

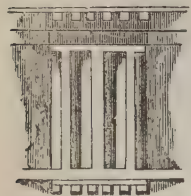
TRIFO′LIUM. See CLOVER.

TRIFO′RIUM, the arcade over the arches of a church between the central and side aisles. It is usually a dark gallery, being the wall-space against which the lean-to roof of the aisles rests. In the later styles, the side-aisles were covered with independent roofs, so as to allow the triforium arches to be filled with glass.

TRIGGER. See LOCK.

TRI′GLA. See GURNARD.

TRI'GLYPH, the ornament in the frieze of the Doric Style (q. v.). It is supposed to represent the ends of the beams in the original wooden temples. It is always divided into channels or flutes, with guttæ or drops below—see illustration.



Triglyph.

TRIGO'NIA, a genus of mollusca, represented at the present day by only three species, natives of Australia, but remarkably abundant in the Secondary rocks. Upwards of 100 species have been described from strata between the Trias and the Chalk inclusive, but not a single species is known from any Tertiary deposit. The shell is trigonal (whence the name), thick, and tuberculated, or ornamented with radiating or concentric ribs. The interior is nacreous. The external ligament is small and prominent, and the huge teeth are large, diverging, and transversely striated. The animal has a long, pointed, and powerful foot, with which it is able to make considerable leaps. The gills are ample, and united behind the body to each other and to the mantle.

TRIGONOCA'RPON, a common fruit in the Coal-measures, occurring in all the strata except the underclays and limestones. Some six or eight species have been established, which differ from each other in size and shape—some being as small as a pea, and others as large as a walnut. They are marked, when preserved in the round, with three longitudinal ridges, and from this character the name was derived. They have never been found attached to any plant. From their shape, and their occurring in such quantities in some localities that they might be gathered by the bushel, it was at first thought that they were palm-fruits; but Dr Hooker, from the examination of several specimens which exhibit structure, has shewn that they are not unlike the structure of *Salisburia*, a drupe-bearing coniferous tree, a native of China and Japan. He found that they were composed of four distinct integuments, and a large internal cavity filled with carbonate of lime, but which, he supposed, originally contained the albumen and embryo. The determination of the affinities of this fruit is the more important, as the existence of conifers in the Coal-measures was known from the occurrence in them of disc-bearing woody-tissue; and the absence of linear leaves and cones makes it the more likely that they belonged to the drupe-bearing division of the order. It is probable that the trunk, to which the generic name *Dadoxylon* has been given, and the casts of the large pith of which is known as *Sternbergia*, had for its leaves the fern-like fossils named *Noggerathia flabellata*, and *Trigonocarpon* for its fruit. Dr Dawson has, however, recently referred some *Trigonocarpa* to *Sigillaria*, and he considers the anomalous organism called *Antholites* to be the bud form of the fruit. He has never found them in contact with *Sigillaria*, and it is much more probable that this was a cryptogamous tree, and consequently had spores, and not seeds, for its fruit.

TRIGONOCE'PHALUS, a genus of extremely venomous serpents, of the family *Crotalidæ*, nearly allied to rattlesnakes, but having the tail terminated with a spine instead of a rattle. The head is covered with plates or shields; the dorsal scales are keeled. *T. rhodostoma* may be mentioned as an example. It is found in Java, and preys chiefly on frogs. *Cenchris*, *Craspedocephalus* and other genera have recently been separated from trigonocephalus. The Mokassin Snake of the southern United States belongs to the genus *Cenchris*. One of the most dangerous serpents of the West Indies is *Craspedocephalus lanceolatus*.

Trigonocephalus rhodostoma.

TRIGONOME'TRICAL SURVEY. Trigonometrical surveying is that higher branch of measurement of the earth's surface in which the use of angular instruments, such as the theodolite, altitude, and azimuth instrument or sextant, is indispensable in forming the network of triangles, on the accuracy of which the correctness of the survey depends. In the article TRIANGULATION, the necessary operations have been briefly adverted to, and in ORDNANCE SURVEY will be found a sketch of the history of the principal modern trigonometrical surveys executed, or now being made.

In the *Aide-Mémoire of Military Sciences*, conducted by officers of the corps of Royal Engineers, a very full and complete article will be found on this subject; and the government blue-books, from time to time issued on the surveys both of Great Britain and India, afford much valuable information on the internal economy and arrangements necessary for carrying on such vast works.

When it is necessary to fix the astronomical position of the stations, of course, the transit, zenith sector, and other instruments used in the observatory, must be transferred to situations very often difficult of access, exposed to strong winds, &c., which adds much to the difficulty of getting correct observations. Meteorological and magnetic observations are often taken simultaneously with the astronomical; and, indeed, are now considered as nearly indispensable in modern operations. See SURVEYING, TRIANGULATION, &c.

TRIGONO'METRY (Gr. *trigōnon*, a triangle, *metria*, measurement), the measurement of triangles. This definition, though expressing correctly enough the scope of trigonometry in its early stages, is now wholly inapplicable, as trigonometry, like geometry, has far exceeded its primitive limits; and though the original name is, for convenience, retained, the science may be more properly defined as the 'consideration of alternating or periodic magnitude.' Trigonometry, within the limits of its earlier definition, is geometrical; its advance beyond these limits is due to the introduction of purely algebraic methods. The quantities with which geometrical trigonometry has to deal are certain lines definitely placed with respect to an angle, and consequently varying with it. These lines generally denominated *trigonometrical functions* of the angle, are the sine, cosine, tanget, cotangent, secant and cosecant; and are represented in the accompanying figure. The angle BAC is placed at the centre of a circle, called the circle of reference; its *sine*, CD, is the perpendicular let fall from the extremity of one radius upon the other; the *cosine*, DA, is that part of the radius between the foot of the sine and the centre; the *tangent*, BE, is drawn

at right angles to one radius to meet the other produced; the *secant*, AE, is the radius produced to meet the extremity of the tangent; the *cotangent*, FG, is drawn from the extremity of a radius at right

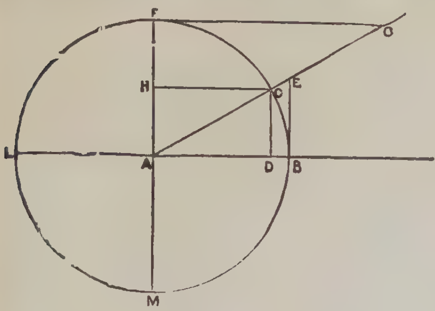


Fig. 1.

angles to one of the former, to meet the other produced; and the *cosecant*, AG, is the radius produced to meet the extremity of the cotangent. Other functions, as the *versed sine*, DB, which is the distance from B to the foot of the sine, and its counterpart, the *coversed sine*, FH, have been occasionally introduced and defined, but they are of no practical use. EAF, the angle which must be added to BAC to make up a right angle, is called the *complement* of BAC; and CAL, the defect of BAC from two right angles, is called its *supplement;* and by inspection of the figure, we can see at once that the sine of BAC, CD, is equal to AH, the cosine of its complement; that the cosine of BAC, AD, is equal to CH, the sine of its complement; and that generally any function of an angle is the co-function of its complement, and *vice versâ;* also, that CD, the sine of CAB, is also the sine of its supplement; AD, the cosine of CAB, is the cosine of its supplement; and that generally the function of an angle is the function of its supplement. If a right angle be added to BAC, then we have the triangles ADC, ABE, shifted so as to be situated in the same relative position to AF as they now are to AB, and each line is consequently at right angles to its former position; hence the sine of BAC is the cosine of (90° + BAC), and similarly of the others. By an extension of this process of investigation, we arrive at the general conclusions, that *if an angle be added to or taken from one or an odd number of right angles, the function of the original angle is the co-function of the one so derived;* and that *if an angle be added to or taken from an even number of right angles, the functions of the original angle are the functions of the derived one.* But since a function of an angle is the same function of its supplement, a knowledge of the function would not enable us to determine to which of the two angles it belonged, unless we possessed some knowledge of more than the mere magnitude of the function. This desideratum is supplied in the following manner: B is taken as the zero-point of reckoning, the radius BA, which is thus supposed to be fixed, is one of the bounding lines of every angle, the other side being supposed to move in the direction BFL, as the angle increases. Let the radius AC be supposed to sweep round the circle in a left-hand direction (viz., towards F), then, as it approaches F, the sine CD increases, till, on reaching F, the sine coincides with the radius; passing F, and moving towards L, the sine diminishes, till, on reaching L, it becomes zero. Continuing its progress round the circle, the angle BAC becomes *re-entrant* (viz., greater than two right angles); and its sine again increases, becoming equal to the radius at M, and diminishing in the fourth quadrant till it becomes zero at B. While the angle increased from B to L, the sine was drawn *downwards;* for the other half of the revolution, it was drawn *upwards;* hence, in the first and second quadrants, the sine is said to be *positive*, and in the third and fourth, *negative*, the position of a function in the first quadrant being adopted as the standard. The following table shews the variation (increase or decrease, and between what limits, as well as the sign affecting it) of each of the functions as the angle increases:

Angle.	Sine.	Cosine.	Tangent.	Secant.	Cotangent.	Cosecant.
0° to 90°	inc. 0 − R, +	dec. R − 0, +	inc. 0 − ∞, +	inc. R − ∞, +	dec. ∞ − 0, +	dec. ∞ − R, +
90° „ 180°	dec. R − 0, +	inc. 0 − R, −	dec. ∞ − 0, −	dec. ∞ − R, −	inc. 0 − ∞, −	inc. R − ∞, +
180° „ 270°	inc. 0 − R, −	dec. R − 0, −	inc. 0 − ∞, +	inc. R − ∞, −	dec. ∞ − 0, +	dec. ∞ − R, −
270° „ 360°	dec. R − 0, −	inc. 0 − R, +	dec. ∞ − 0, −	dec. ∞ − R, +	inc. 0 − ∞, −	inc. R − ∞, −

We here observe that all the functions increase and decrease alternately as the angle of which they are the functions passes from one quadrant to another; also that the sine and cosecant are affected by the same signs, as also are the cosine and secant, and tangent and cotangent.

Again, from fig. 1 we obtain, from the properties of right-angled and of similar triangles, the following relations between the functions: $\text{Sin.}^2 + \text{Cos.}^2 = \text{R}^2$, $\text{Tan.}^2 + \text{R}^2 = \text{Sec.}^2$, $\text{Cot.}^2 + \text{R}^2 = \text{Cosec.}^2$, Tan. : R : : Sin. : Cos., Sec. : R : : R : Cos., Cot. : R : : Cos : Sin., Cosec. : R : : R : Sin., and Cot. : R : : R : Tan. From these eight relations, we can easily obtain any one function in terms of any other, both as regards its magnitude and sign.

The reason why the circle and its radius are employed in the definition of the functions is, that we may obtain some invariable standard by which to estimate them, for while, as the angle increases from 0° to 360°, its functions are in a state of constant change, their standard of reference, the radius, remains the same. For greater simplification, the radius is taken as unity, and the relations become $\text{sin.}^2 + \text{cos.}^2 = 1$, $\text{tan.}^2 + 1 = \text{sec.}^2$, $\text{cot.}^2 + 1 = \text{cosec.}^2$, and (by the reduction from the proportional to the divisional form of the other five relations) $\text{tan.} = \frac{\text{sin.}}{\text{cos.}}$, $\text{sec.} = \frac{1}{\text{cos.}}$, $\text{cot.} = \frac{\text{cos.}}{\text{sin.}}$, $\text{cosec.} = \frac{1}{\text{sin.}}$, $\text{tan.} = \frac{1}{\text{cot.}}$; the various functions being expressed in terms of the assumed unit. Thus, in the right-angled triangle ABC (fig. 2), if AC be radius, BC = sin., and AB = cos., of the angle A; but if the radius be assumed as unity, $\text{sin. A} = \frac{\text{BC}}{\text{AC}}$, $\text{cos. A} = \frac{\text{AB}}{\text{AC}}$, and

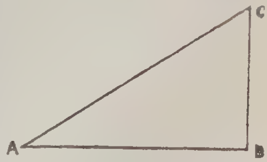


Fig. 2.

similarly from the above relations, $\text{tan.} = \frac{\text{BC}}{\text{AB}}$, $\text{sec.} = \frac{\text{AC}}{\text{AB}}$, $\text{cot.} = \frac{\text{AB}}{\text{BC}}$, and $\text{cosec.} = \frac{\text{AC}}{\text{BC}}$; and in algebraic trigonometry these latter are the definitions of the trigonometrical functions.

The only angular functions which geometry enables us to determine with accuracy are those belonging to the angles of an equilateral triangle (Euc. I. 1), an isosceles right-angled triangle (Euc. II. 9), and an isosceles triangle which has each of the angles at its base double of the third angle (i. e., base angles each 72°, vertical angle, 36°) (Euc. IV. 10); and from these, by means of a proposition (demonstrated in all text-books on the subject) which determines the functions of the angle $(A + B)$ from a knowledge of the functions of A and of those of B; and also, as a corollary to the preceding, the functions of 2A, 4A, 8A, &c., and inversely of $\frac{1}{2}A$, $\frac{1}{4}A$, &c., from a knowledge of those of the angle A, have been obtained and tabulated the functions of all angles from 1′ to 45°, the functions of angles from 45° to 360° being, as is evident from the above remarks respecting complementary and supplementary angles, merely repetitions of these.

The relations between the angles and sides of a triangle (fig. 3) are three in number, and are obtained from simple geometric considerations; they are—(1) $AB : AC :: \sin. C : \sin. B$; (2) $\cos. B = \frac{AB^2 + BC^2 - AC^2}{2 AB . BC}$; (3) $AB + AC : AB - AC :: \tan. \frac{1}{2}(B + C) : \tan. \frac{1}{2}(B - C)$. From these relations, in conjunction with the fact that the three angles of a triangle collectively amount to 180°, it is possible, having given any three (one being always a side) of the six elements (three sides and three angles) of a triangle, to determine the other three. It is this that constitutes trigonometry in its primitive and elementary form. If the triangles be right-angled, only the first relation, and the property of the sides of a right-angled triangle, are necessary for the complete solution. Further information on this subject will be found in any text-book.

Fig. 3.

Algebraic trigonometry is one of the most important branches of analysis, but is too extensive and varied to be even sketched here; suffice it to say, that in it the trigonometrical functions are not considered as geometrical magnitudes, but as numerical quantities having certain relations to each other, and that the circle as well as the angular functions are treated as multiples or sub-multiples of the radius. Many important results, such as the approximate estimation of the circumference of a circle, the completion of the solution of cubic equations, &c. have been obtained by its means; and a thorough knowledge of its modes and results is absolutely necessary to an acquaintance with higher mathematics.

Spherical trigonometry is plane trigonometry applied to spherical triangles. See any text-book.

TRI′KHALA, or TRIKALA, a town of European Turkey. 33 miles west-south-west of Larissa. It is built on the slope of a hill, manufactures cotton and woollen stuffs, and has a large transit-trade with Epirus and Albania. The neighbouring plains, which are watered by the Salembria (anc. *Peneus*), are rich in all sorts of fruits. Pop. about 10,000. T. is the *Trikka* of Homer, and was celebrated in the classic ages for its temple of Æsculapius.

TRILLIA′CEÆ, a small natural order of plants, belonging to the class Dictyogens (q. v.) of Lindley. They are herbaceous plants, with tubers or root-stocks, whorled leaves, hermaphrodite flowers; perianth of six leaves, the three inner leaves sometimes coloured; six, eight, or ten stamens, the filaments extending beyond the anthers in awl-shaped points; the ovary free, 3—5-celled, with numerous ovules; the fruit succulent. The order is characterised by narcotic properties. The genus *Paris* (q. v.) belongs to it.

TRI′LOBITES, an order of fossil crustacea entirely confined to the palæozoic rocks. They are specially abundant in the Silurian period, and disappear in the lower members of the coal-measures.

The body was covered with a chitinous shield, which consisted of a large united cephalic shield, a variable number of body segments, and a tail or pygidium, composed of a number of joints, more or less anchylosed. The eyes were sessile and compound. The lenses are frequently beautifully preserved, and in some species are so large that they can easily be seen with the naked eye. In *Asaphus caudatus*, each eye had at least 400 facets; and in the large *A. tyrannus*, it is estimated that there are no fewer than 6000. In some species, a bifurcated plate has been found in the region of the mouth, which is believed to be a labrum, but no antennæ or limbs have been yet detected in any specimen. They may have been entirely destitute of antennæ, as in some living animals to which they are nearly related these organs are very rudimentary; and their feet were probably soft and leaf-like appendages, bearing the gills, which would speedily perish, and leave no traces in a fossil condition. The sexes are believed to be indicated by variations in the length of the cephalic and caudal spines, and in the prominence of the head lobes. The members of the order varied greatly in size, some species being scarcely larger than a pin's head, while others, like *Asaphus gigas*, attained a length of 18 inches. It is probable that many named species may be only larval or transition forms of others. The minute *Agnosteus* is frequently found in such quantities as to indicate that it lived in shoals, as if it were the larval form of some large trilobite. Lockwood and Packard have shown that they resemble closely certain early immature stages of the *Limulus* of the American coast. Burmeister considers that trilobites have their nearest allies in the minute Phyllopoda, a section of entomostracous crustacea, which are continually swimming, at various depths, on their backs. He consequently supposes that trilobites lived gregariously in shallow water close to shore, moved only by swimming near the surface, and could not creep at the bottom; that they swam in an inverted position, with the belly upwards; that they made use of their power of rolling themselves into a ball as a defence against attacks from above; and that they lived on smaller water-animals.

Asaphus tuberculatus

Above 400 species have been described, and grouped into 50 genera. Of these, 46 are Silurian, 22 Devonian, and 4 Carboniferous.

TRI′LOGY, the name given by the Greeks to a group of three tragedies, either connected by a common subject, or each representing a distinct story. A satyric drama was customarily added as a termination, whence the whole was sometimes termed a *tetralogy*. Every tragic poet that wished to take part in a poetic contest had to produce a trilogy along with a satyric drama at the Dionysiac, Lenæan, and Anthesteriac festivals. We possess

only one perfect specimen of the classic trilogy,—the *Oresteia* of Æschylus, which embraces the *Agamemnon*, the *Chœphoræ*, and the *Eumenides*.—See Welcher, *Die Aeschylische Trilogie* (Darmst. 1824; Franz, *Des Aeschylos Oresteia* (Leip. 1846).

TRIMETHY′LAMINE, or TRIMETHYLIA $C_3H_9N = (CH_3)^3N$), is a very remarkable organic base, with an extremely powerful and disagreeably fishy odour. It is obtained as a colourless gas, readily soluble in water, and having a strong alkaline reaction. With acids, it readily forms soluble salts. It occurs in large quantity in the pickle in which herrings (especially their roes) have been lying, and in the spirit in which old anatomical preparations have been long suspended; and (strange as it may appear) it imparts to the leaves of *Chenopodium olidum* their atrocious odour, and to the flowers of *Cratægus oxyacantha* (the common hawthorn), their agreeable fragrance. It is obtained by distillation from ergot of rye, from guano, the juice of the leaves of red beet-root, and from putrid yeast, and has been detected in small quantity in human urine and in the blood of the calf. It may be formed artificially by the action of iodide of methyl on dimethylamine; but the source from which it may most readily be derived is herring-brine.

TRIMMER, a political term in use in the reigns of Charles II. and William III., originally applied to certain politicians of Charles's time, of whom the chief was Charles Montagu, Earl of Halifax, who held opinions half-way between the extreme Whigs and Tories. Halifax adopted the name Trimmer as a title of honour, maintaining that everything good was a medium between extremes.—The same term was applied more generally by Dryden and other writers of the same period to all who, professing to be friends to monarchy, were at the same time enemies to the Duke of York, and who were equally obnoxious to the court and to the fanatical republicans.

TRIMMER, MRS SARAH, was born at Ipswich on 6th January 1741. Her father was a Mr Joshua Kirby, a man of intelligence and piety, who removed to London about 14 years after, and became tutor to the Prince of Wales, afterwards George III., in the science of perspective, a subject in connection with which he was favourably known by several ingenious works. Among other distinguished persons with whom his daughter had now the advantage of meeting, was the great Dr Johnson, with whom she speedily became a favourite. In 1759, her father was appointed Clerk of the Works at Kew Palace, whither he went to reside; and here Miss Kirby became acquainted with Mr Trimmer, to whom, in 1762, she was married. It was not till the year 1780 that she came before the world as an authoress, by the publication of her *Easy Introduction to the Knowledge of Nature*, intended for the use of young people. The success of this little work encouraged her to further efforts in the same field; and during the next few years, she issued in succession six volumes of *Sacred History, selected from the Scriptures, with Annotations and Reflections adapted to the Comprehension of Young Persons.* Her next work was the *Economy of Charity*, addressed to benevolent people of her own sex, which went through several editions. She edited subsequently in succession *The Family Magazine*, and the *Guardian of Education;* a selection of her contributions to the first of which was issued under the title of *Instructive Tales;* her chief papers to the other being collected in the volume published after her death as *An Essay upon Christian Education.* Besides this, she laboured assiduously in the preparation of school-books for the Society for Promoting Christian Knowledge, intended to supersede the imperfect manuals then in use; and did much miscellaneous work of a somewhat cognate kind. She died quite suddenly on the 15th of December 1810. Her works for the young, though now for the most part superseded, were excellently adapted for their purpose, and for a long time had an extensive popularity.

TRIMÛRTI (from the Sanscrit *tri*, three, and *mûrti*, form) is the name of the Hindu triad, or the gods *Brahman* (masculine), *Vishn'u*, and *S'iva*, when thought of as an inseparable unity, though three in form. The *Padma-Purân'a* (see PURÂN'A), which, being a Purân'a of the Vaishn'ava sect, assigns to Vishn'u the highest rank in the T., defines its character in the following manner: 'In the beginning of creation, the great Vishn'u, desirous of creating the whole world, became threefold: creator, preserver, and destroyer. In order to create this world, the supreme spirit produced from the right side of his body himself as Brahman; then, in order to preserve the world, he produced from the left side of his body Vishn'u; and in order to destroy the world, he produced from the middle of his body the eternal S'iva. Some worship Brahman, others Vishn'u, others S'iva; but Vishn'u, one, yet threefold, creates, preserves, and destroys; therefore, let the pious make no difference between the three.' And the *Matsya-Purân'a*, where speaking of *Mahat*, or the intellectual principle of the Sânkhya philosophy (see SÂNKHYA), says that 'Mahat becomes distinctly known as *three* gods, through the influence of the three qualities, goodness, passion, and sin; being one person and three gods—viz., Brahman, Vishn'u, and S'iva.' Apart, therefore, from sectarian belief, which makes its own god the highest, and gives him the attributes also of the other gods, *Trimûrti* implies the unity of the three principles of creation, preservation, and destruction, and as such belongs more to the philosophical than to the popular belief. When represented, the T. is one body with three heads: in the middle, that of Brahman; at its right, that of Vishn'u; and at its left, that of S'iva. The symbol of the T. is the mystical syllable *om*, when (*o* being equivalent to $a + u$) *a* means Brahman; *u*, Vishn'u; and *m*, S'iva. See OM.

TRINCOMALEE′, a seaport town and magnificent harbour on the north-east coast of Ceylon, in 8° 34′ N., and 81° 12′ E. The town is built on a bold peninsula, which divides the inner and outward harbours. It is a place of great antiquity, but its ancient renown was due more to religious than political or geographical considerations, for it was here that the Malabar invaders of Ceylon built one of their most sacred shrines—the 'Temple of a Thousand Columns,' to which pilgrims flocked from all parts of India. This celebrated shrine was demolished by the Portuguese, who fortified the heights with the materials derived from its destruction, 1622 A.D. It was next held by the Dutch; but in 1672, during the rupture between Louis XIV. and the United Provinces, the French took T., which was abandoned by the Dutch in a panic. In 1782, the French admiral, in the absence of the British commander, took possession of the fort, and the English garrison retired to Madras. It was restored to the Dutch the following year, and they retained it until the capture of Ceylon by the British in 1795. The modern town is in no way remarkable, and, with the exception of the official buildings, makes a poor appearance. There are Hindu temples in barbarous taste, and religious festivals and processions to which a similar epithet may be applied. The Bay of T. is land-

locked, and presents a scene of tranquil beauty; its fine expanse of water is still as an inland lake, and equally sheltered. 'On comparing this magnificent bay,' says Sir J. E. Tennent, 'with the open and unsheltered roadstead of Colombo, and the dangerous and incommodious harbour of Galle, it excites an emotion of surprise and regret that any other than Trincomalee should have been selected as the seat of government and the commercial capital of Ceylon. As a harbour, Trincomalee is renowned for its extent and security; but its peculiar superiority over every other in the Indian seas consists in its perfect accessibility to every description of craft in every variation of weather.' The mean temperature for the year at T. is 81°·4. Pop. about 15,000.

TRINCOMALEE WOOD. See HALMALILLE.

TRI'NGA. See SANDPIPER.

TRINIDA'D, an island belonging to Great Britain, and the most southerly of the West India Islands, being in latitude 10° 30′ north. It is about 50 miles long, varying in breadth from 30 to 60 miles, and the area is about 1754 sq. m. Pop. (1881) 153,128. It is separated from the mainland (Venezuela) by the Gulf of Paria, and the extreme points on the west coast are only 13 and 9 miles respectively from it. The Dragon's Mouth entrance, to the north, is the deepest channel to the harbour; and the southern, or Serpent's Mouth, is shallow, owing to the deposits brought down by the Orinoco. The gulf itself is shoaling up from the same cause. The aspect of the island of T. is different from that of the Caribbean Islands generally: the mountains are not so lofty, and they extend in an east and west direction along the northern coast, clothed with stately forests, and their margins fringed with overhanging mangroves, dipping into the sea. From the double-peaked mountain called Tamana, are seen the lovely and fertile valleys and plains with which the other part of the island abounds. The island has several good harbours, and some tolerably large rivers.

The chief town, Port of Spain, is one of the finest towns in the West Indies. It was originally built of wood, but was burned down in 1808, and the town has since been rebuilt of the good stone procured in the neighbourhood. The streets are long, wide, well paved, clean, and shaded with trees. There is another town called San Fernando, with two or three pretty villages.

A remarkable phenomenon is a pitch lake near the village of La Brea, composed of bituminous matter floating on the surface of fresh water, about 3 miles in circumference, and 80 feet above the sea. The mineralogy of the island is but little known. The soil is very rich and productive. The climate is hot and moist; the thermometer ranges from 75° to 85°, sometimes 90°; and the rain-fall is about 75 inches.

The most important products are cocoa, sugar, rum, molasses, coffee, cotton, arrow-root, cocoa-nut oil, hides, &c. The value of the exports in 1870, £1,277,574; imports, £1,042,678. The increase in the population of the island—being about 25 per cent. from 1861 to 1871, as shown by the census returns of those years —was occasioned principally by the voluntary immigration from the neighbouring colonies and from India. Trinidad is a crown colony, ruled by a governor, an executive council of 3, and a legislative council of 13 members. There are 11 ministers of the Church of England, and 18 of the Church of Rome; there are also ministers of the Wesleyan and other denominations.

T. was first discovered by Columbus in 1498, and thus named by him because three mountain summits were first seen from the mast-head when discovered; but no permanent establishment was founded there until 1532 by the Spaniards. In 1783, it first fell into the hands of the British, who were confirmed in possession of it in 1802.

TRI'NITY, a river of Texas, U. S., formed by the union of two streams, West Fork and Elm Fork, which rise near the northern boundary of the state, and unite 150 miles south-east, the main stream flowing thence 550 miles in the same general direction to Galveston Bay, about 40 miles north of the city of Galveston. It is navigable 300 to 500 miles.

TRINITY, a river of California, rising near the coast-range, and flowing through a country of rich gold-mines, into the Klamath River.

TRINITY, THE DOCTRINE OF THE, is the highest and most mysterious doctrine of the Christian religion. It declares that there are three Persons in the Godhead, or divine nature—the Father, the Son, and the Holy Ghost, and that 'these three are one true, eternal God, the same in substance, equal in power and glory—although distinguished by their personal properties.' The most elaborate statement of the doctrine is to be found in the Athanasian Creed, which asserts that 'the Catholic faith is this: That we worship one God as Trinity, and Trinity in Unity—neither confounding the persons nor dividing the substance—for there is one person of the Father, another of the Son, and another of the Holy Ghost. But the Godhead of the Father, and of the Son, and of the Holy Ghost is all one; the glory equal; the majesty co-eternal.'

It is admitted that the doctrine is not found in its fully-developed form in the Scriptures; but it is supposed to be clearly revealed in its elements in the New Testament, and also to be indicated in many of the statements and revelations of the Old Testament. The form of expression in speaking of God in the Old Testament Scriptures—the plural *Elohim*, coupled with a singular verb; the apparent distinction recognised in the revelations to the Patriarchs and Moses between Jehovah and 'the Angel of Jehovah;' the mode in which 'the Spirit' and 'Word' of God, and 'Wisdom' (Proverbs viii.) are spoken of; and the gradual unfolding of the doctrine of a 'Messiah,' are all supposed to be indications from the earliest times of the truth of a plurality of persons in the Godhead; and in the New Testament Scriptures the doctrine is represented as clearly taught in the Trinitarian formula of baptism —the general character of the claims and prerogatives of Jesus Christ, especially the ascription to Him of the designation 'the Son of God,' and in the functions attributed to the Holy Spirit. The evidence is held conclusive of the equal divine nature and yet distinct personality of the Son and the Spirit along with God the Father. It is generally conceded, however, that the Christians of the 2d, and even of the 3d c., were far from having a clearly understood and recognised doctrine on this high subject. They were content for the most part to use Scriptural expressions in speaking of the Father, and the Son, and the Spirit, without defining articulately their relation to one another. It was not till the progress of opposing heresies sought, on the one hand, to degrade the divine dignity of Christ (Ebionitism in its various forms, and Arianism); or, on the other hand, to confound the personality of Christ with God the Father —a heresy known in its special form as Patripassianism — that the church was led to define in the Nicene Creed the relation of the Son to the Father; and further, in the Nicæno-Constantinopolitan Creed, the relation of the Spirit to the Father. This creed was specially directed against the opinions of Arius. A further clause was afterwards added, known as

the *filioque* clause, which determined the procession of the Spirit from the Son as well as the Father; but this clause, and the doctrine which it embodies, was never accepted by the Eastern Church, to whose finer speculative genius is owing the determination of the controversies which began in the 3d c. regarding the Divine nature. The Western or Latin Church had a far less refined genius for such speculations; and in so far as it meddled with them, has imparted to them a coarser and more contradictory aspect. What is known as the 'Athanasian Creed,' which is now well understood to be of Latin, and not of Greek origin, is a sufficient illustration of this.

It is not our part here to criticise the evidence for the doctrine of the Trinity, or the validity of the doctrine itself; it is enough to say that the evidence which we have briefly sketched in outline, has been accepted as satisfactory, not only by the Roman Catholic and oriental communions, but also by all the great Protestant communions. The only exception in modern times to the reception of the doctrine is in the case of the Socinians or Unitarians, who occupy in their teaching very much the position of the ancient Humanitarians (Ebionites). They reject the doctrine of the Trinity as incredible, and regard Christ merely as a higher prophet. There have, however, been various thinkers within the Christian church, such as Dr Samuel Clarke in the beginning of last century, who, while accepting generally the doctrine of the Trinity, have rejected the special terms in which it is defined in the Creeds, and whose views have been known as semi-Arianism.

TRINITY COLLEGE, Cambridge, was founded by King Henry VIII., in 1546, upon the site, and partly out of the revenues, of several more ancient foundations. The names of these were King's Hall, Michael House, Fyswicke's Hostel, Hovinge Inn, Gregory's, Margaret's, Catherine's, Gerard's, and Tyler's hostels. Of these, the first two deserve special mention. King's Hall (*Aula Regis*) was so called after its founder, Edward III., whose father, Edward II., had maintained 32 scholars, called king's scholars, but had died before completing his intentions. The Hall was founded in 1337. The master's stipend was fourpence, and that of each scholar twopence, per day, with two robes at Christmas. The revenues of King's Hall at the time of its surrender to Henry VIII. amounted to £214 per annum.

Michael House was founded 1324 A.D., by Hervey de Stanton, who was Chancellor of the Exchequer to Edward II. He dedicated his college to the Trinity, the Virgin Mary, St Michael the Archangel, and All Saints. When Henry VIII. united these smaller foundations into the one great college, henceforth called TRINITY COLLEGE, besides other endowments, he added the estates of twenty-seven dissolved monasteries, which made up the gross revenues to about £1700 per annum. Queen Mary added very largely to these benefactions, and provided for 20 additional scholars, 13 poor scholars or sizars, 4 chaplains, and a choir. Queen Elizabeth gave to the college a new set of statutes, by which the college was governed until the reign of Queen Victoria, when these statutes were revised. Subsequently, under the Cambridge University Commission (1859—1860), new statutes have again been given, by which several important changes have been introduced. Such Fellows as fill the office of bursar, tutor, or lecturer in the college, or professor in the university, are exempt from the necessity of taking holy orders, which must otherwise be done by all Fellows within seven years of taking the degree of Master of Arts. Marriage also is permitted to Fellows in a few exceptional cases, and to the chaplains and librarian. The Master of the college must be in holy orders, and the appointment is in the gift of the crown. The following are some of the more eminent names in the list of Masters: John Whitgift, who was raised to the see of Worcester; Thomas Nevile, Dean of Canterbury, who built the greater part of the cloistered court known by his name: he died 1615. To Dr Barrow, who was made Master in 1672, the college owes the finishing of Nevile's Court, and the erection of the Library, for which the designs were furnished by Sir Christopher Wren. The famous Dr Bentley was Master from 1700 to 1742. The late William Whewell was one of the most distinguished men that this college has produced, and one of the best of its Masters. He was a munificent benefactor to the college, to which he added one new court during his life; and at his death bequeathed his large fortune to the building of another, and to the founding of a professorship of International Law. See WHEWELL. To these may be appended the following few names of popular interest, with the dates of their death: Lord Bacon, 1626; Sir Edward Coke, 1634; Cowley, the poet, 1667; Lord William Russell, executed 1683; John Dryden, 1701; Samuel Pepys, the diarist, 1703; SIR ISAAC NEWTON, 1727; Richard Porson, 1808; Lord Macaulay, 1859. Of living men, it will not be invidious to select only the names of Adam Sedgwick, the geologist, and Alfred Tennyson, the Laureate.

The present society consists of the Master, W. H. Thompson, Regius Professor of Greek, 60 Fellows, 4 chaplains, librarian, 65 scholars, and 16 sizars.

With the exception of the Hall and the Library, the college buildings are not of any architectural pretensions. The statue of Newton by Roubiliac, in the ante-chapel, is one of the finest modern statues.—See Cooper's *Annals and Memorials of Cambridge*; Dyer's *History;* and the *University Calendar.* The judges, when on circuit, have the right of being entertained at this college.

TRINITY COLLEGE, Oxford. In 1290, Richard de Hoton, Prior of Durham, founded Durham College at Oxford, for the education of the student-monks of Durham. At the dissolution of the monasteries, the property of this institution was transferred by Henry VIII. to the newly erected chapter of Durham Cathedral. Its site and buildings, however, passed into the hands of Sir Thomas Pope, who, in 1554, obtained a licence from Philip and Mary to found a college on the spot, to be called T. C., for the maintenance of 20 scholars, of whom 12 were to be Fellows, and 8 scholars, properly so called. The scholars were to be elected from the founder's manors, and the Fellows from the scholars. In 1557, Sir Thomas Pope added four scholarships; and about the same time another was added by a Mr Blount. There are also three exhibitions. By the ordinances issued by the commissioners under 17 and 18 Vict. c. 81, the fellowships and scholarships are thrown open without restrictions; the latter are tenable for 20 terms, value £60 a year, besides rooms. This is the first college, after Balliol, which was founded by a layman, as were all colleges subsequent to this date. It is also remarkable as having been, like St John's, founded by a Roman Catholic after the Reformation. It presents to 10 benefices.

TRINITY HALL, Cambridge. This college, which is distinct from Trinity College, was founded 1349—1350 A.D. for Scholars of Canon and Civil Law, as well as for the education of clergy, by

William Bateman, Bishop of Norwich, who was also co-founder of Gonville and Caius College. It appears that the bishop was induced to found the college in consequence of the great pestilence which had recently swept away most of the clergy of his diocese, so that there could not be found sufficient to supply the parochial cures. In a bull of Pope Clement VI., dated at Avignon, 1349, it is stated that there were at that time no less than 1000 parishes in the diocese void of incumbents. The first Master was Robert de Stratton. There are thirteen fellowships, of which ten may be held by laymen for ten years, and are not vacated by marriage. There are also three law-studentships and twelve scholarships.—See Cooper's *Memorials and Annals*, and Dyer's *History of Cambridge;* also the *University Calendar.*

TRINITY HOUSE (properly called, The Corporation of the Elder Brethren of the Holy and Undivided Trinity), a corporation intrusted with the regulation and management of the light-houses and buoys of the shores and rivers of England. In 1518, a society under the above name was founded at Deptford by Sir Thomas Spert, Knight, and incorporated by Henry VIII. Its privileges were confirmed in 1658; and in 1680 its first light-house was erected; all the light-houses which had previously existed on the English coast having been built by private individuals under patents from the crown. By 6 and 7 Will. IV. c. 79, and the Merchant Shipping Act, 1854 (17 and 18 Vict. c. 104), private rights in light-dues were abolished, and the exclusive right of lighting and buoying the coast committed to the Board of Trinity House. The power of Trinity House to appoint and license pilots for the English coast is also regulated by this last-named statute. The Cinque Ports pilots, who had formerly been under control of a separate society, were, by 16 and 17 Vict. c. 129, and the Merchant Shipping Act, 1854, placed under the jurisdiction of Trinity House. Trinity House was in the practice of distributing certain funds arising from light and pilotage dues, and from the sale of ballast, for certain charitable purposes; but the right which the society possessed to the surplus of light-dues was done away with by the Merchant Shipping Act, 1854. This same act gave Trinity House a general supervision over the Commissioners of Northern Lights and the Ballast Board of Dublin, the corporations which have the charge of the light-houses and buoys of Scotland and Ireland respectively, subject to an appeal to the Board of Trade, to whose general superintendence Trinity House is also subject in matters relating to England. The light-houses of the Isle of Man are, by special arrangement, under the charge of the Commissioners of Northern Lights.

The corporation of Trinity House consists of a master, a deputy-master, nineteen acting elder brethren, eleven honorary elder brothers, and an unlimited number of younger brethren. The master and honorary elder brethren are chosen on the ground of eminent social position. The younger brethren all belong either to the naval service or the mercantile marine, and are admitted by the court of elder brethren. The deputy-master and acting elder brethren are elected by the court of elder brethren from such of the younger brethren as are possessed of the qualifications of having obtained the rank of commander in the navy four years previously, or having served as master in the merchant service on foreign voyages for at least four years. The Board discharges its duties by means of committees and sub-committees for special purposes, whose proceedings are, when necessary, subject to confirmation by the general court. Two elder brethren of Trinity House assist the Court of Admiralty at the hearing of every suit for collision, and occasionally in suits for salvage. Their duty is to guide the court by advice only; though influential, their opinion is not legally binding on the judges. The gross income of Trinity House for 1858 was £257,214, and the gross expenditure £172,285. The surplus income is chiefly devoted to the extinction of the debt incurred in pursuance of the act of 1846 for the purchase of private rights in light-houses.

TRINITY SUNDAY, the Sunday immediately following Pentecost Sunday, so called as being set aside for the special honour of the Blessed Trinity. The date of the origin of this festival has been a subject of much controversy. No such festival as Trinity Sunday was known to the Fathers of the early centuries. The most decisive evidence of its non-acceptance by the general church up to the 9th or 10th c., is the absence even to this day of any corresponding festival in the separated Greek Church; and although it seems quite certain that the festival was introduced in certain particular churches of the West, at earlier and varying dates, the general establishment of Trinity Sunday as a common festival of the whole Western Church, dates from a decree of John XXII., who died in 1334. Nevertheless, the mass and office peculiar to the day are of much greater antiquity, and may be traced, at least in part, in several sacramentaries and other liturgical books of the earlier centuries.—See Benedict XIV., *De Festis*, i. 2, 10; Binterim, *Denkwürdigkeiten Christ-katholisch. Kirche*, vol. v. part 1.

TRINO'DA NECE'SSITAS, three species of contributions, to which, in Anglo-Saxon times, all the lands of England, whatever their tenure, not excepting those of the church, were subject; viz. *Brygebot*, for keeping the bridges and highways in repair; *Burg-bot*, for keeping the fortresses in repair; and *Fyrd*, for maintaining the military and naval force of the kingdom.

TRI'O, in Music, a composition for three voices or for three instruments. The same term is also applied to a movement in $\frac{3}{4}$ time in a different key, which follows a minuet or other movement, and always leads back to the previous movement in the original key.

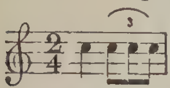
TRIPE DE ROCHE, a name originally given by the Canadian hunters to certain lichens, species of *Gyrophora*, which they are often forced to use as food, and now very generally in use as the designation of these plants. They are nutritious, but bitter, nauseous, and purgative. They have a leafy peltate thallus, variously lobed and notched—in *G. proboscidea* of a smoky-brown colour, and in *G. erosa* almost black; the shields are round, without stalks, covered with a black membrane, and marked with circles and plaits upon the surface. These lichens grow on rocks in northern regions, or on high mountains. They are to be found in abundance in Spitzbergen, and a species, well known as a native of the Scottish mountains, is found in the Himalaya at an elevation of more than 18,000 feet.

TRIPIT'AKA. See PIT'AKA.

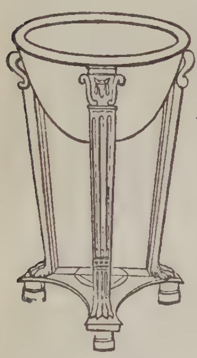
TRIPLE ALLIANCE, the name by which two different treaties are known in history; viz. 1. A treaty concluded in 1668 at the Hague between England, Holland, and Sweden, having for its object the protection of the Spanish Netherlands, and the checking of the conquests of Louis XIV. 2. An alliance concluded in 1717 between Britain, France, and Holland against Spain, which included among its stipulations that the Pretender should quit France, and that the treaty of Utrecht should be carried into effect as regards the demolition of

Dunkirk. The Protestant succession was guaranteed by this treaty in England, and that of the Duke of Orleans in France.

TRIPLET, in Music. When a note is divided into three in place of two parts—as when a minim is divided into three crotchets, a crotchet into three quavers, &c.—the group is called a triplet, and it is usual to place the figure 3 over it. Thus—



TRIPOD (Lat. *tripos*, Gr. *tripous*, three-footed), any article of furniture supported on three feet. Three-legged caldrons and bronze altars more especially came under this denomination in classical times; many of them are of exquisite workmanship, and richly decorated. The sacrificial tripod in its earliest form resembled the caldron, with the addition of three rings at the top to serve as handles. Of this description seems to have been the tripod at Delphi, from which the Pythian priestess delivered her oracles, with the addition, however, of a round flat plate on the top, on which the priestess sat while giving the response, while a laurel wreath lay on it at other times. Tripods of a similar form were given as prizes at the Pythian games; and at Athens, a tripod was considered an appropriate reward for a successful choragus. Some beautiful tripods were found at Pompeii; and there are several very interesting specimens in the British Museum. Analogous to the classic tripod, is Thor's *kettle* in Scandinavian mythology, which was probably the origin of the witches' caldron.



Tripod.

TRIPOLI, or TRIPOLIS (in its modern Arabic form, *Tarâbulus*), the ancient *Tripolis*, a seaport, and one of the chief commercial towns of Syria, capital of a pashalic in the eyalet or government of Sidon, is situated near the coast, on the eastern border of a small triangular plain running out into the Mediterranean, and on both sides of the river Kadisha. The town is substantially built of stone, with many remains of medieval architecture, and is supplied with excellent water by an aqueduct. It is surrounded by gardens of orange, lemon, mulberry, apricot, and other fruit trees, which are planted also in the town itself, and give the place a rich and picturesque appearance; but the low marshy neighbourhood renders it unhealthy. On the left side of the river stands the castle built by Count Raymond of Toulouse, in the 12th c., when the city was taken by the Crusaders. At the north-west apex of the plain already mentioned lies the port of Tripoli, called El-Mîna (the Landing-place), or the Marina, a small fishing village about 1½ miles distant from the town. The harbour, like other harbours on the Syrian coast, scarcely deserving of the name, is formed by a line of low rocky islets stretching north-west from the point. The trade of the place has of late much declined, being superseded by that of Beirût; its exports now consist chiefly of silk, sponges, and tobacco: there are also manufactures of soap. Pop variously stated at 13,000 and 20,000, and consisting of Mohammedans and Greek Christians It is the see of a Greek bishop. T. is regularly visited by the steamers of the French Messageries.

The ancient city of T. was situated on the plain, where immense numbers of granite shafts and other relics of antiquity are still found. Its name (the *Three Cities*, or the *Triple City*) was derived from the circumstance of its being founded by the cities of Tyre, Sidon, and Aradus, as an entrepôt for trade, and a point of federal union. It was for many centuries a place of great commercial importance.

TRIPOLI, a regency of the Ottoman Empire, and the most easterly of the Barbary States, North Africa, is bounded on the W. by Tunis, on the S. by the Libyan Desert and Fezzan, on the E.—if we include the plateau of Barca (q. v.)—by Egypt, and on the N. by the Mediterranean. Area roughly estimated at 200,000 sq. m.; pop. uncertain, but believed to be about 1,500,000. T. is less mountainous than the rest of Barbary, the Atlas range terminating here in a couple of chains running parallel to the coast, and never exceeding 4000 feet in height. There are no rivers in the country, and rain seldom falls during the long hot summers, but the dew is copious, and supports vegetation in favoured spots. The coast region (about 1100 miles in length) is very fertile about Tripoli and Mesurata, where all sorts of tropical fruits, grain, wine, cotton, madder, &c., are produced; but further east, along the shores of the Gulf of Sidra, sandy desolation reigns. The interior yields senna, dates, and galls; the carob and lotus are indigenous. Sheep and cattle are reared in great numbers, and T. is also noted for its small but excellent horses, and its strong and beautiful mules. The commerce of the country consists in exporting, principally to Malta and the Levant, the products of the country and of the interior of Africa (gold-dust, ivory, natron), which are brought hither in caravans across the desert. The imports (which consist chiefly of European manufactures) have been declining gradually of late years, owing mainly to two causes. The *first* is the new direction which the trade of Central Africa is assuming. By the Niger and its great tributary, the Benue, European manufactures are more rapidly and more economically conveyed to the northern intertropical regions than by the tedious overland route of the Great Sahara. The *second* cause is the abolition of the slave-trade, which, of course, has stopped the demand for all the commodities that alimented the traffic.

T. is subdivided into four *livas*, or provinces—Tripoli, Benghazi, Mesurata, and Gadames. The governor-general has the title, rank, and authority of a pasha of the Ottoman Empire. He is appointed by the sultan, and in his turn appoints the subordinate governors of the Tripolese provinces, who bear the title of beys. The military force of the country consists of a body of Turkish soldiers, some 10,000 in number, whose business is to keep down insurrections, but who were formerly wont to vary it by creating them. The natives (who comprise Libyan Berbers, Moors, and a few Arabs) pay to the imperial government, by way of tribute, a tenth of all the products of the soil; and there is, besides, a special tax imposed on every olive tree and date tree, on every camel, on all horned cattle, on sheep and goats, and on Jewish residents. Little wisdom and less justice are shewn either in the imposition or collection of the taxes.

In ancient times, T. (when we first read of it) appears to have formed the most westerly portion of the territory of Cyrenaica (Barca), or at least to have been tributary to the Cyrenæans, from whom, however, it was wrested by the Carthaginians. It next passed to the Romans, who included it within

the province of Africa and gave it the name of *Regio Syrtica.* About the beginning of the 3d c. A.D., it became known as the *Regio Tripolitana* (on account of its three principal cities, Œa, Sabrata, and Leptis, which were leagued together; whence its present name Tripoli), and was probably raised to the rank of a separate province by Septimius Severus, who was a native of Leptis. Like the rest of North Africa, it was conquered by the Arabs (see Barbary), and the feeble Christianity of the natives was supplanted by a vigorous and fanatical Mohammedanism. In 1552, the Turks got possession of it, and have ever since been the rulers of the country, though the authority of the sultan, up till 1835, had been virtually at zero for more than a century. In that year, however, an expedition was despatched from Constantinople; the ruling dey, Karamanli (in whose family the sovereignty had continued uninterrupted since 1714) was overthrown, and imprisoned; a new Turkish pasha, with vice-regal powers, was appointed, and the state made an eyalet of the Ottoman Empire. Several rebellions have since taken place (notably in 1842 and 1844), but they have always been suppressed.

TRIPOLI, called by the Turks *Tarabûlûs*, and probably the *Œa* of antiquity, the capital of the foregoing state, lies on a bit of rocky land projecting into the Mediterranean, and forming a bay. It is surrounded by high walls with bastions, and is irregularly built, but has beautiful gardens. There are 12 mosques, 3 synagogues, and 2 Christian churches. T. is the principal seaport of the country, and has important manufactures of leather, carpets, scarfs, &c. From T. caravans passed through the Desert of Sahara to Timbuktu, Bornu, &c., to obtain the products of Sudan; but this overland trade has greatly fallen off of late years. Tripoli being the centre of a large agricultural population, the native capitalists occupy themselves in money-lending to the peasantry. In 1870 the exports were £599,913, but in 1871, owing to the bad harvest and the French war, only £40,895. The imports of 1871 were £18,040. The steamers of the French, Russian, and Egyptian companies call at stated intervals. The population is estimated at 25,000. Though the majority are Moslems, nearly all the trade is in the hands of Jews and Christians.

TRIPOLI, a mineral substance employed in polishing metals, marble, glass, &c., so named because it was originally brought from Tripoli in Africa. It is a siliceous rock, composed of very minute particles, somewhat loosely held together, so as to yield readily to the nail, and to crumble down in water like rotten-stone. It has a coarse, dull, earthy fracture, is rough to the touch, and is of a gray, yellow, or red colour. The particles which entirely compose it are the siliceous frustules of *Diatomaceæ*, which occur unaltered in it, and are united together without any visible cement. Ehrenberg estimated that every cubic inch of Bilin Tripoli weighing 220 grains, contained 41,000,000,000 of these minute water-weeds. Deposits of Tripoli occur in the Tertiary rocks in every quarter of the world.

TRIPOLI'TZA ('three cities'), a town of Greece, under the Turkish rule capital of the Morea, now the chief town of the government of Mantinea, lies 22 miles south-west of Argos, and 39 south-west of Corinth, in a plain 3000 feet above the sea. It derives its name from being near the sites of the three ancient cities, Tegea, Mantinea, and Pallantium. In 1821, it was stormed by the Greek insurgents; and in 1828 razed to the ground by the troops of Ibrahim Pasha; it has since, however, been rebuilt. Previous to 1821, it had 20,000 inhabitants; the present pop. is only 7441.

TRI'PPANT, in Heraldry, a term analogous to Passant (q. v.), but applied to animals of chase.

TRI'PTYCH (Gr. *tris*, thrice, and *ptysso*, I fold), a set of tablets consisting of three leaves, each painted with a distinct subject, but joined together by hinges, and capable of being folded so as to present a new face. The general character of such tablets has been explained under DIPTYCH (q. v.), the difference of name, 'triptych,' 'polyptych,' being taken from the number of the leaves. In ecclesiastical use, the diptych has been already explained as commonly meaning rather the register of names inscribed on the tablets than the tablets themselves. The triptych, on the contrary, generally speaking, contained sacred pictorial representations rather than written registers or records.

TRI'REME (from *tres*, three, and *remus*, an oar) is the designation given in ancient times to a galley having three banks of oars. It is said to have been first employed by the Corinthians in their war with Corcyra, 664 B.C. In the Persian and Peloponnesian wars, triremes were the largest vessels employed; but at the time of Alexander, we find that galleys with four and five banks had gradually come into favour. In the Punic wars, the Carthaginians generally employed quinqueremes; and as the Roman triremes could have no chance against vessels with such high bulwarks, the Romans henceforth constructed their war-vessels after the model of the Carthaginian quinquereme.

The banks of oars were elevated above each other, but not perpendicularly; and the lowest rank of rowers having the shortest oars and easiest work, had the least pay. The trireme or quinquereme was also provided with a square sail, which was used when the wind was favourable for voyaging to relieve the labour of the rowers, but it was not employed in action. The crew consisted of about 200 men; and on a smooth sea, in speed and accuracy of manœuvring, the trireme was little inferior to a modern steamboat. In the earlier times, before the Persian war, and even later, victory depended more upon the number and valour of the soldiers on board, than upon the skill of the seamen. Herodotus mentions that besides the crew there were 40 marines serving on board each Ionian trireme. The Athenians improved this system by decreasing the number of fighting men, and trusting more to the skilful management of their vessels. In a fight, the aim of each trireme was not, as before, to grapple with its opponent, but to dash with the greatest momentum possible with its beak against the enemy's vessel, and strike it amidship, or, at any rate, disable his banks of oars on one side. Fighting men were not so much wanted for these tactics; and so we find later on, in the Peloponnesian wars, the number of marines in each ship reduced to ten. It is singular to see this system of ram-fighting coming once more into vogue. A contrivance for strengthening the prow of the trireme, and increasing its efficiency as a ram, gave the Syracusans their final victory over the Athenians in the harbour of Syracuse.

TRISA'GION, or **TRISHAGION** (Gr. *tris*, thrice, and *hagios*, holy; Lat. *tersanctus*, thrice holy), one of the doxologies in use in the Greek Church, which is repeated in the form of versicle and responses by the choir in certain parts of the liturgy. The words of the Trisagion are: '*Hagios O Theos, Hagios Ischuros, Hagios Athanatos, eleeson hemas!*' (O Holy God, O Holy Mighty One, O Holy Immortal, have mercy on us!) This doxology in its original Greek form, is one of the few fragments of the Greek liturgy which (like the *Kyrie Eleison*) are retained in the original language in the Roman mass. It occurs in the service of

Good Friday in the procession and veneration of the cross. See GOOD FRIDAY.

TRISMEGI'STUS (Gr. Thrice-greatest), an epithet applied to the Egyptian Hermes (q. v.), or Thoth (q. v.), by the Neo-Platonists, and the devotees of magic, alchemy, and mysticism generally, who looked upon him as the source of all mysterious doctrines. See HERMETIC BOOKS.

TRI'SMUS NASCE'NTIUM is a form of lock-jaw occurring in newly-born children, in consequence mainly of impurity of the atmosphere. In Iceland, this disease annually carries off a large proportion of infants between the fifth and twelfth days after birth; and it prevails in the island of St Kilda, in the Northern Hebrides, *four out of every five* of the infants dying between the eighth and twelfth day of their existence; the cause of this mortality being the contamination of the atmosphere from the manure which is laid upon the floors and trodden under foot to the depth of several feet. It is also very frequent and fatal in the West Indies, where it is known as the 'ninth-day disease.' Another of its names is 'the jaw-fall,' from the circumstance of the jaw relaxing and dropping on the breast shortly before death. By a proper system of ventilation the prevalence of the disease has been in many places greatly reduced. In so fatal a disease, it is almost unnecessary to refer to treatment. Immediate removal to a pure air, a warm bath, and a dose of castor-oil, should be tried.

TRISTAN DA CUNHA, an island in the South Atlantic, midway between South America and the Cape of Good Hope, lat. 37° 6′ S. It is about 20 miles in circumference. It was once a British military station established to keep a watch on the Island of St Helena during the imprisonment of Napoleon. At his death the soldiers were withdrawn, with the exception of a corporal named Glass and one or two companions, from whom a colony has sprung which numbered, in 1873, 80 souls. The island is apparently a solid mass of rock, rising abruptly from the sea and ascending to the height of 3000 feet. The crater of an extinguished volcano surmounts it, forming a dome 5000 feet high.

TRISTRAM is the hero of a British legend, which originally had no connection with the stories of King Arthur and the Round Table, although later minstrels sought to interweave them. Briefly, the legend goes as follows.

T., son of Rouland Rise, Lord of Ermonie, and Blanche Fleur, sister of Mark, king of Cornwall, having lost both parents at the period of his birth, is brought up for the first fifteen years of his life at the court of the monarch who had slain his father, after which he proceeds to Cornwall, and is acknowledged by his uncle, who appoints him his heir and successor. Having received a severe wound in a duel, he is cured by Ysolt or Ysonde, daughter of the queen of Ireland; and on his return to Cornwall, informs his uncle of the marvellous beauty of the Irish princess. Mark is charmed, and sends his nephew to Dublin, at the head of a select body of knights, to solicit her hand in marriage. The king's suit is successful, and T. escorts her on her voyage to England; but both having unwittingly partaken of a love-potion (which was intended for Mark), they are immediately inflamed with a criminal passion for each other, which is the source of all their subsequent misfortunes. Ysolt is married to the king of Cornwall; but by the help of her clever maid, Brenqwain, she contrives to have numerous secret interviews with her lover, and for some years succeeds in allaying the jealousy and suspicions of her husband. At last, however, T. is banished from Cornwall, and goes to Wales, where he performs prodigies of valour. His uncle again becomes reconciled to him, and invites him back to his court, where the amours of the incorrigible lovers are renewed. A renewed banishment is the consequence, and T. goes abroad to Spain, Ermonie, Brittany, in the last of which countries he marries another Ysolt, called, for distinction's sake, Ysolt *with the white hand*, daughter of the Duke of Brittany. After numerous romantic and impossible exploits, he sails for England to see his old mistress, and renew his guilty intercourse, for which the poet liberally provides facilities. After a time, he returns to Brittany, and once more engages in his favourite occupation of fighting, but is desperately wounded, and can only be cured by Ysolt of Cornwall. He despatches a messenger to the princess, telling him that on his return he is to hoist a white sail as he approaches the coast of Brittany, if Ysolt accompanies him; but if not, a black sail. The queen of Cornwall hastens to save her lover; and as the vessel nears the shores of France, T.'s wife, Ysolt *with the white hand*, recognises the white sail, and, fired with jealous hate at the thought of a rival's approach, hurries to her husband's chamber, and tells him the messenger's ship is coming in with black sails spread. T., in an agony of disappointed love, sinks back and expires. When the queen of Cornwall lands, and hears of his death, she rushes to the castle, throws herself on his corpse, and dies beside him. King Mark subsequently learns the story of the love-potion, and buries the twain in one grave, planting over Ysolt a rose-bush, and over T. a vine, which grew up so inextricably intertwined that no man could ever separate them—a beautiful symbol of their inseparable hearts, and of that sacred union which death had accomplished between those whom accident alone had made criminal, and whom fortune had often torn apart.

The popularity of the story in the middle ages was unbounded. The scene of the principal exploits, and the residence of the principal personages, is Cornwall, from which one is disposed to claim a British or Welsh paternity both for the legend and the literature; and this is the view that underlies Sir Walter Scott's argument in behalf of the purity of the metrical version of *Sir Tristram* which he published (ed. 1806) from the Auchinleck MS., and which is considered to be the composition of Thomas the Rymer (q. v.). He seeks to shew that although the story of Sir T. was well known in France before the time of the Scottish poet, the probability is that the latter gathered his materials from Welsh sources, and not from Norman minstrels. Without inquiring too curiously into the antiquity of the Welsh Triads (where the history of Sir T. occurs), it may be allowed that there is sufficiently good reason for adopting the hypothesis of a British origin of the work, and for assuming that it spread from Wales to Brittany, and thence over Europe, though some critics are of opinion, that while the *story* may belong to Cornwall, the *poem* is primarily a product of Armorican genius. As early as the middle of the 12th c., however, the legend had become a favourite throughout the whole of France; and it subsequently found its way into Spanish, Italian, German, Scandinavian, Slavic, and Greek literature.—See Michel, *Tristan; Recueil de ce qui reste des Poëmes relatifs à ses Aventures* (Lond. and Paris, 1835).

TRI'TICUM. See WHEAT and COUCH GRASS.

TRI'TON, in Greek Mythology, a son of Poseidon and Amphitrite, who dwells with his parents in a golden palace at the bottom of the sea. He usually figures as an attendant on his father, riding over the Mediterranean on a horse or other sea-monster, and soothing the turbulent waves by blowing his

shell-trumpet—his 'wreathed horn,' as Wordsworth calls it. The later poets speak of Tritons, in the plural, as a race of subordinate sea-deities, who are

Triton.

described by Pausanias as having sea-green hair and eyes, gills below the ears, human noses, broad mouths with the teeth of animals, scales on their bodies, and instead of feet, a tail like that of a dolphin. They were frequently represented in works of art.

TRI'UMPH (Lat. *triumphus*) was the name given in ancient Rome to the public honour bestowed on a general who had been successful in war. It consisted in a solemn procession along the *Via Sacra* up to the Capitol, where sacrifice was offered to Jupiter. The victor sat in a chariot, drawn by four horses—his captives marching before, his troops following behind. Certain conditions had to be fulfilled before a triumph could be enjoyed, and it was the business of the senate to see that these were enforced. Under the Empire, generals serving abroad were considered to be the Emperor's lieutenants, and therefore, however successful in their wars, they had no claim to a triumph. They received instead *triumphal decorations* and other rewards.

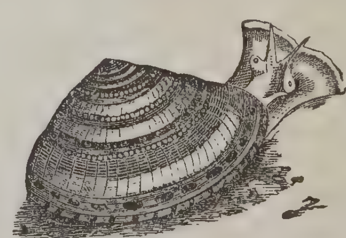
The appearance that Rome presented on the occasion of a triumph, especially in later times, was joyous in the extreme. All work was suspended; the temples were thrown open, and decorated with flowers; the populace were clad in holiday attire, and crowded the steps of all the public buildings in the *Via Sacra*, and the forum, or mounted the scaffoldings erected for the purpose of viewing the procession; banquets were spread before every door. As for the *imperator* himself, after having pronounced a eulogy on the bravery of his soldiers, he ascended his triumphal car, entered the city by the *porta triumphalis*, where he was met by the senate, and now the procession began. First marched the senate, headed by the magistrates; next came a body of trumpeters; then a train of carriages and frames laden with the spoils of the vanquished; then a body of flute-players, followed by the oxen doomed to be sacrificed, and the sacrificing priests, &c.; then the distinguished captives with bands of inferior prisoners in chains; after whom walked the lictors of the imperator, having the fasces wreathed with laurel. Next came the hero of the day—the imperator, in a circular chariot, attired in an embroidered robe (*toga picta*) and flowered tunic (*tunica palmata*), bearing in his right hand a laurel bough, in his left, a sceptre, and having his brows garlanded with Delphic laurel. He was accompanied by his children and his intimate friends. His grown-up sons, the legates, tribunes, and equites, rode behind; and the rear was brought up by the rest of the soldiery, singing or jesting at their pleasure, for it was a day of carnival and licence. When the procession had reached the Capitoline, some of the captive chiefs were taken aside, and put to death; the oxen were then sacrificed, and the laurel wreath placed in the lap of Jupiter. In the evening, the imperator was publicly feasted, and it was even customary to provide him a site for a house at the public expense.

The *ovation*, or lesser triumph, differed from the greater chiefly in these respects; that the imperator entered the city on foot, clad in the simple *toga prætexta* of a magistrate: that he bore no sceptre, was not preceded by the senate and a flourish of trumpets, nor followed by his victorious troops, but only by the equites and the populace, and that the ceremonies were concluded by the sacrifice of a sheep instead of a bull, whence, doubtless, the name *ovation* (from *ovis*, a sheep). The ovation, it is scarcely necessary to add, was granted when the success, though considerable, did not fulfil the conditions specified for a triumph.

TRIU'MVIRATE (Lat. a union composed of *three* men) is the name given in Roman history to the private league entered into between Pompey, Crassus, and Cæsar—the three most powerful men of their time; the object of which was to carry out their own schemes of political aggrandisement, in spite of the opposition of the senate. This compact was not a triumvirate, in the proper sense of the term: it had no legally constituted existence: it was, in fact, only a treasonable conspiracy of three men against the legitimate authority of the state. The term is less incorrectly applied to the division of government between Octavian (Augustus), Mark Antony, and Lepidus in the civil wars that followed the murder of Cæsar—an arrangement sanctioned, and therefore legalised by the senate. The former is usually called the *first*, the latter, the *second* triumvirate.

TRI'VIUM (Three Roads), the name given to the lower section of the Seven Liberal Arts (see ARTS), constituting the circle of study in the middle ages. It embraced Grammar, Logic, and Rhetoric.

TRO'CHIDÆ, a family of gasteropodous molluscs, of the order *Pectinibranchiata*, section *Asiphonata*. The shell has the aperture entire, closed with an operculum; spiral, and very generally top-shaped, as in the genus *Trochus*, the species of which are popularly known as Top-shells. The species are very numerous, and widely distributed.



Trochus.

They feed on sea-weeds, and some of them are found on rocks between high and low water mark. Many of them are very beautiful, and some of the small kinds are often employed to adorn head-dresses, and for other ornamental purposes, the epidermis and outer layer being removed. Several species are frequent on the British shores. Some of the tropical ones attain a comparatively large size. The T. are very closely allied to *Turbinidæ*.

TRO'CHILUS AND TROCHI'LIDÆ. See HUMMING-BIRD.

TRO'GLODYTES (Gr. *Trōglodytai*—Gr. *trōgle*, a hole, and *dyo*, to get into; hence cave-dweller), the name given by the ancient Greeks to various tribes or races of uncivilised men, who dwelt either in natural caverns, or in holes which they had dug for themselves in the earth. They are mentioned by Strabo as existing as far west as Mauretania, and as far east as the Caucasus; but perhaps the best known T. of ancient times were those of Southern Egypt and Æthiopia, where a considerable district of country was called *Regio Troglodytica*. They could not speak articulately, but shrieked or screamed like the lower animals; though it ought always to be remembered that the Greeks, from whom we have such statements, are not very trustworthy authorities in the matter of language, accounting every dialect which they did not understand, a barbarous jargon. The chief occupation of the T. was herding cattle, though we also read that they were hunters and robbers. They are likewise mentioned as serving among the light troops in the army of Xerxes. Their habits of life were rude and debased; they are reported to have eaten not only the flesh, but the bones and hides of their cattle; their drink is said to have been a mixture of milk and blood; and they had a community of wives. The wives tattooed their bodies; and the men, if not clothed in cattle-skins, went about *in puris naturalibus*. But the most revolting and unnatural of their practices was their treatment of the dead. They are reported to have bound the corpse neck and heels together, affixed it to a stake, pelted it with stones, amid shouts of laughter; and after they had buried it beneath a cairn of missiles, to have placed a horn on the top, and gone away!

What measure of truth there may be in such stories, it is now impossible to say; but archæological investigations into the pre-historical life of our own and other countries, have led to the conclusion, that a race of cave-inhabiters preceded in most countries the races that lived in houses built on the surface of the earth; and perhaps we shall not be far wrong, if we regard Troglodytism as the primitive state of all, or the greater part of, mankind.

TROGO'NIDÆ, a family of birds, ranked by

Resplendent Trogon (*Calurus resplendens*).

some naturalists, on account of their habits, in the order *Insessores*, and tribe *Fissirostres*; but more generally, on account of the formation of the feet—two toes before, and two behind—placed in the order *Scansores*. The T. are remarkable for the beauty of their plumage, which is soft, full, and brightly coloured. The bill is short, strong, with a wide gape; the tail generally long, in some species very long; the feet small, and in many, feathered almost to the toes. All the T. are tropical: they belong chiefly to the south-eastern parts of Asia, the Indian Archipelago, and South America. They abound most of all in South America. They inhabit forests, where they sit motionless on branches, waiting for insect prey, darting upon insects as they fly past. They make their nests in the hollows of decayed trees. Their flesh is highly esteemed for its delicacy and flavour. They are of small size. In brilliancy of plumage, some of them are excelled by no birds except humming-birds.

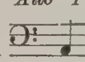
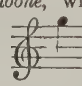
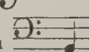
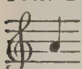
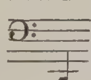
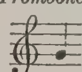
TROIZK, a town of Eastern Russia, on the border of Siberia, in the government of Orenburg, stands on the Oug, 420 miles south-west of Tobolsk. It is the seat of considerable commerce, especially during the summer months, at which season a large trade is carried on with the Kirghis and the Bokharians, who arrive in caravans from Central Asia. Pop. 6930.

TROLLOPE, MRS FRANCES, a novelist and miscellaneous writer of some eminence, was born in the year 1780. Her father was an English clergyman. In 1809, she was married to Mr Anthony Trollope, a barrister-at-law. In 1829, she went to America; and during a three years' residence in the United States, amassed the materials of her first book, *Domestic Life of the Americans*, published in 1832. This work attracted great attention; and its severe strictures were vigorously resented by those whom they caricatured and traduced. From this time forward, the literary activity of Mrs T. was nearly uninterrupted, and her name became one of the more notable of the time. Novels of Society and Impressions of Travel make up the sum of her works. Of her novels, the most successful is, perhaps, *The Widow Barnaby* (3 vols., 1839); with its sequel, *The Widow Married* (3 vols., 1840); followed by *The Barnabys in America, or Adventures of the Widow Married*. Mrs T. was a woman of strong talent, and her works are full of shrewd observation, and true, if at times somewhat coarse, humour. They were popular in their day, and very well deserved their popularity; but already they are well nigh forgotten. No list of them in detail seems needed. During the life of her husband, Mrs T. resided chiefly at Harrow. During her later years, much of her time was passed in Italy, where her eldest son, Thomas Adolphus, had taken up his abode. She died at Florence, 6th October 1863.

TROLLOPE, ANTHONY, second son of Mrs Frances Trollope, and one of the most popular novelists of the day, was born in 1815. He was educated at Winchester, and subsequently Harrow. While filling a responsible official situation in the general Post-office, he found, or made, leisure to amuse the public with a long series of novels, of very remarkable merit. The first work which decisively drew attention, *The Warden*, was followed by a continuation, *Barchester Towers*, which remains, perhaps, the cleverest of all his books. In rapid succession to these, came *Doctor Thorne*, *The Bertrams*, *The Three Clerks*, *Castle Richmond*, *Framley Parsonage*, *The Kellys and the O'Kellys*, *Orley Farm*, *The Small House at Allington*, *Rachel Ray*, *Miss Mackenzie*, *Hunting Sketches*, *The Belton Estate*, *The Claverings*, *Chronicles of Barset*, *Phineas Finn*, *He knew he was Right*, *The Vicar of Bullhampton*, *Sir Harry Hotspur of Humblethwaite*, *The Eustace Diamonds*, *The Way we now Live*, and *The American Sen-*

ator. Besides these works, Mr T. published pleasant volumes entitled *The West Indies and the Spanish Main* (1859); *North America* (1862); *South Africa* (1868); and *Life of Cicero* (1881); and occasionally contributed to English and American higher periodical literature. T. was esteemed one of the most popular of our novelists, sketching the superficial aspects of society with a charming facility of touch which rendered his works unfailingly agreeable. He died December 6, 1882.

His elder brother, THOMAS ADOLPHUS, has lived for many years at Florence, and is favourably known to the public by his *Girlhood of Catherine de Medici*, *A Decade of Italian Women*, and a graceful and touching Italian story, entitled *La Beata;* also *Paul V. the Pope and Paul the Friar*, *Beppo the Conscript*, and the *History of the Commonwealth of Florence* (Lond. 1865, 4 vols.), which was very favourably received.

TRO'MBONE (Ital. great trumpet), a large deep-toned brass instrument, of the trumpet species, but consisting of two separate parts, so constructed that the two ends of one fit into those of the other, and consequently, by sliding the one part in or out, the tube through which the air passes may be shortened or lengthened, and the pitch changed at pleasure. Three kinds of trombone are in general use, differing in pitch: the *Alto Trombone*, with a compass extending from  to ; the *Tenor Trombone*, with a compass from  to ; and the *Bass Trombone*, whose compass extends from  to . The music for these instruments is written on the alto, tenor, and bass clefs respectively. There is also a *double-bass* trombone, which is but rarely used. The trombone, if judiciously employed, is a very effective instrument in an orchestra—the tone is grander and more powerful than that of the trumpet.

TROMP, MARTIN HARPERTZOON, a celebrated Dutch admiral, was born at the Briel in 1597. When a boy, he went to sea with his father, a commander in the Dutch navy. In an engagement off the coast of Guinea with an English cruiser, his father was killed, and young T. made prisoner. His captors compelled him to serve as a cabin-boy for two years and a half, after which his history becomes for some time obscure. In 1622, we find him a lieutenant on board a Dutch ship-of-the-line; and two years afterwards, Prince Maurice gave him command of a frigate. In 1629, the famous Admiral Peter Hein took command of T.'s ship, and was killed by his side. Disgusted by some real or imaginary slight, T. about this time retired from the service. In 1637, he returned, and was created Lieutenant-admiral, by the Stadtholder, Frederick Henry. He was appointed to the command of a squadron of eleven ships. He now prosecuted a vigorous naval war against the Spaniards, taking in one celebrated action, fought on October 21, 1639, 13 richly laden galleons. But the events which were to render the name of T. immortal did not occur until the commencement of hostilities between England and Holland in 1652. On May 19 of that year, he encountered the English fleet under Admiral Blake. The Dutch were defeated with the loss of two ships of war. T. was for a while superseded in command by Ruyter and De Witt, but he was soon afterwards reinstated. On November 29, same year, he again encountered Blake in the Strait of Dover. This time, success was decidedly with the Dutch. The English fleet was obliged to retire; and T. sailed up the Channel with a broom at his mast-head, to denote that he had swept his foes from the seas. They were, however, not long in returning. On the 18th of February 1653, Monk and Deane having been united in command with Blake, they attacked T. near Portland, and defeated him, though only after a contest memorable for its obstinacy. It lasted three days, at the close of which Blake had taken or destroyed 11 ships of war and 30 merchantmen, killed 2000 of the enemy, and captured 1500. On June 2 and 3 following, another terrific battle took place off North Foreland, in which six Dutch vessels were captured, 11 sunk, and the remainder driven into Calais roads. On July 31, the warfare was again renewed off the coast of Holland. On this occasion, the Dutch lost 30 men-of-war, and Admiral T. was killed.

T. was a thorough seaman, homely in manner, benevolent in disposition, and enthusiastic in his calling. He was buried at Delft with great pomp and solemnity.

TRO'MSÖE, a small island on the north-west coast of Norway, in Finmark, lies between the island Kvalö and the mainland. It is four miles long, and about a mile and a half broad. On the eastern side of the island is the small but thriving town of the same name, the seat of a bishop. Russian vessels from Archangel and the White Sea visit this town, and bring corn, which they exchange for dried fish. Pop. about 3000.

TRON or TRONE weight, the most ancient system of weight used in Scotland, is so called from *trone*, a species of heavy beam or balance set up in the market-place, and employed for the weighing of heavy wares. The weights employed in the public markets formed the most convenient reference, and consequently tron weight became the standard. The tron lb. contained 20 oz., but from the custom of giving 'one in' to the score, was always reckoned at 21 oz.; this was the most general value; but it varied in the different market-towns between this and 28 oz. The later tron stone or standard weight contains 16 tron lbs., each lb. 16 tron oz., and each tron oz. 16 drops; the tron lb. is estimated to be equivalent to 1·3747 lbs. avoirdupois.

TROON, an important seaport in the county of Ayr, Scotland, 8 miles south-west of Kilmarnock, and 6 north of Ayr. The greater part of the town (which is not older than the present century) occupies a bare and level promontory; but along the broad and beautiful strand of Ayr Bay, known as the 'South Beach,' stretches, for nearly half a mile, a row of handsome villas and cottages, built chiefly for the accommodation of summer visitors. The place is yearly becoming more attractive as a sea-coast residence, partly on account of its extreme salubrity, and partly on account of the ample scope afforded by its wide stretch of sands for the simple amusements of the sea-shore. The harbour, which occupies the extremity of the promontory, is secure and spacious, and is much frequented. The principal exports are coal and iron, of which Ayrshire yields an abundant supply.

TROOP, in Cavalry, the unit of formation, forming the command of a captain, consisting usually of 60 troopers, and corresponding to a company of infantry. The officers of a troop are the captain, lieutenant, and cornet. Two troops form a squadron. The trooper's pay is 1*s.* 3*d.* a day.

TROO'PIAL (*Molothrus*), a genus of birds of the family *Sturnidæ* (see STARLING), having a short, thick, conical bill; long, pointed wings; and a

slightly rounded tail. The Cow T. (*M. pecoris*), also called Cow Blackbird, Cow-pen Bird, &c., is common in North America, passing the winter in the southern parts of the continent, and migrating northwards in spring. Its plumage is of a shining black colour, except the head and neck, which are

Troopial (*Molothrus pecoris*).

blackish brown. It is very generally to be seen in attendance on cattle, picking up the insects which they disturb, or which are attracted by their droppings. Like the cuckoo, it makes no nest of its own, but deposits its eggs in the nests of other birds.

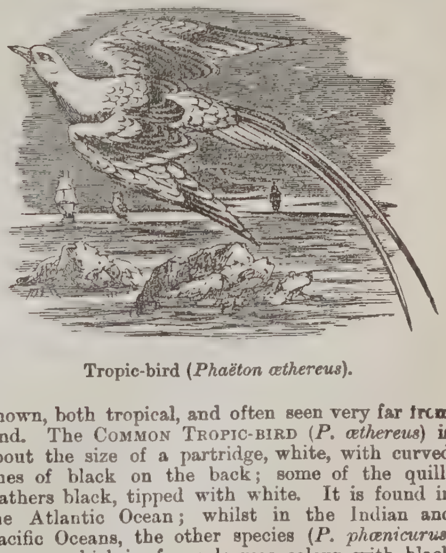
TROPÆ'OLUM, a genus of plants of the natural order *Tropæolaceæ*. This order is allied to *Balsaminaceæ* and *Geraniaceæ*. The species are not numerous, and are all natives of South America. They are smooth herbaceous plants, somewhat succulent, with an acrid or pungent taste, trailing or twining stems, and alternate simple or divided leaves, destitute of stipules. The species of the genus T. form the greatest part of the order, and have usually simple peltate leaves. *T. majus* is the well-known INDIAN CRESS of our gardens, the unripe fruit of which is often used to give pungency to pickles, under the name of *Nasturtium*. It is a native of Peru, and has long been much cultivated in America as an ornamental plant, climbing amongst bushes or on trellises, and taking hold by the curving stalks of its leaves; its stems from six to eight feet long, its foliage abundant, and its flowers large, orange, or dark red. The young leaves are used in salads. The Nasturtium is really a perennial, although it flowers within a few months from the time of sowing, and in America is always treated as an annual, not being able to endure the winter. *T. minus* is very similar, but of weaker growth, and its flowers smaller. *T. peregrinum*, although much more recently introduced into Britain than the Indian cress, has now become almost equally common, and is a great favorite in flower-gardens. It is popularly called the CANARY PLANT. Its stems are long and slender, and it speedily covers a high trellis. Several other species are frequent and fine ornaments of gardens and greenhouses. The tubers of *T. tuberosum* are eaten in Peru. Their taste is peculiar.

TROPE (Gr. *tropos*, a 'change,' a 'turning') is the name of a figure of speech which does not appear to differ from Metaphor (q. v.).

TROPHO'NIUS, in Greek legend, was the most skilful architect of his day, and was the son of Erginus, king of Orchomenus, or of Apollo. Along with his brother, Agamedes, he built the temple of Delphi and the treasury of King Hyrieus in Bœotia, which the two are said afterwards to have plundered. After his death, he was worshipped as a hero, and had a celebrated oracle at Lebadeia (Livadia) in Bœotia. 'The entrance to the oracle was a very narrow aperture on the summit of a mountain, protected by a marble parapet about two cubits in height, and by brazen spikes above it.' The votary who wished to enter the 'Cave of Trophonius,' in order to consult the oracle, after preparing himself for several days previously by purification and sacrifice, lay prone on his back, and put his feet into the cave, when he was caught by some unseen force, and violently pulled inside.

TRO'PHY (Lat. *tropæum*, Gr. *tropaion*, from *trepo*, to put to flight—the letter *h* in the English word being an intrusive letter) was a memorial of victory erected on the spot where the enemy had turned to flight. Among the Greeks (with the exception of the Macedonians, who erected no trophies), one or two shields and helmets of the routed enemy, placed upon the trunk of a tree, served as the sign and memorial of victory. After a sea-fight, the trophy consisted of the beaks and stern-ornaments of the captured vessels, set up on the nearest coast. It was considered wrong to destroy such a trophy, and equally wrong to repair it, when it had fallen down through time, for animosity ought not to be perpetual. In early times, the Romans never erected trophies on the field, but decorated the buildings at Rome with the spoils of the vanquished. Of this practice, we have a familiar instance in the *rostra* or beaks set up in the forum. In later times, pillars and triumphal arches were employed to commemorate victories. Besides these, in modern times, the humiliation of an enemy is rendered lasting by such devices as the bridge of Jena, of Waterloo, and by the distribution of captured cannon. Morally considered, this practice is no improvement upon the simple and perishable trophies of the ancient Greeks.

TROPIC-BIRD (*Phaëton*), a genus of birds, ranked by some in the family *Pelecanidæ*, by others in *Laridæ*. The bill is strong, pointed, and almost arched; the head completely feathered; the wings long; the tail short, except two feathers, which are very long and slender. Only two species are



Tropic-bird (*Phaëton æthereus*).

known, both tropical, and often seen very far from land. The COMMON TROPIC-BIRD (*P. æthereus*) is about the size of a partridge, white, with curved lines of black on the back; some of the quill-feathers black, tipped with white. It is found in the Atlantic Ocean; whilst in the Indian and Pacific Oceans, the other species (*P. phœnicurus*) appears, which is of a pale rose colour, with black wing coverts, and the long feathers of the tail red. The tropic-birds breed on high cliffs.

TRO'PICS (Gr. turning-points or limits) are two parallels of latitude on the terrestrial globe, passing through the most northerly and southerly points on the earth's surface at which the sun is vertical. On the Armillary Sphere (q. v.), consequently, the ecliptic (the representation of the sun's path) touches but does not cross the tropics. The tropics include between them all those points on the earth's surface at which the sun is ever vertical. The tropic north of the equator is called the Tropic of Cancer, because the sun at the summer solstice (at which time he is vertically over that tropic) enters the constellation of Cancer; and the southern one is, for a similar reason, denominated the Tropic of Capricorn. The tropics are not absolutely fixed at a uniform distance from the equator, but the limits of their variation are extremely narrow; on January 1, 1866, they were situated in 23° 27′ 14·77″ N. and S. respectively.

TRO'PPAU, the capital of Austrian Silesia, situated on the right bank of the Oppa, a tributary of the Oder, is a well-built fortified town, 184 miles north-east of Vienna by railway. It is the seat of the provincial government, and has a castle, cathedral, several palatial buildings, churches, and public schools, a library of 20,000 volumes, a museum of Silesian antiquities, important manufactures of machinery, cottons, linens, and beet-root sugar, and an active transit trade. Pop. 10,500. A diplomatic congress was held here in October and November 1810, which was subsequently removed to Laibach (q. v.).

TROU'BADOUR (Provençal, *trobar;* Fr. *trouver*, to find, of unknown derivation). In Provençal poetry (see TROUVÈRE), a troubadour was a polished and cultivated poet—what the Germans call a *Kunstdichter* (art-poet)—who did not make a trade of his muse, in opposition to the musician and jongleur, who wandered about the country singing for money. Yet this distinction only gradually shewed itself. At first, all classes of the community were nearly equally rude, and what pleased the peasant in the shape of song, pleased the prince also; but by degrees, a superior refinement and sensibility manifested themselves in the tastes and manners of courts, and this superiority found poetical expression in a more artistic kind of verse than had hitherto prevailed. Great nobles, princes, and kings who practised verse-making for their pleasure, or out of chivalrous gallantry, were always called troubadours; while inferior knights, court-attendants (M. Lat. *ministeriales;* hence *menestrels*, minstrels), and even citizens and serfs who lived by their art, or at least took money for the exercise of it, were sometimes called troubadours, and sometimes jongleurs. Under this last name were classed the musicians, singers, jugglers (a word, in fact, which is only a corruption of *jongleur*), &c.; all, in short, who did not themselves make or invent (*trobar*) poems, but only recited or chanted them, or whose business it was to accompany the singer on some musical instrument. The more celebrated troubadours had one or several such jongleurs in their service, as it was considered *infra dig.* for a poet to be his own fiddler. This new troubadour poetry (*art de trobar*), which it may be remarked was *lyrical*, while the popular minstrelsy was mainly of the *epic ballad* sort, exercised a considerable influence on the advancement of literature and culture generally; yet those who practised it never formed themselves into a guild, or into special schools, but preserved a certain free individualism, which gives a fine picturesqueness to the outlines of their history. At all the courts (great and small) in Southern France, Northern Spain, and Italy, they were esteemed a brilliant ornament of society; princes and fair dames (often themselves troubadours, as has been remarked) were proud of their praise, and their service of gallantry, or dreaded the biting raillery of their satiric muse; while, on the other hand, the majority of the troubadours gladly attached themselves to the court of a great prince or noble, sometimes praising their master in *sirventes* (service-songs), sometimes censuring him, but at any rate, always selecting some lady as the 'mistress of their heart,' to whom they, under a general or allegorical name, addressed their love-songs (*cansos*), whose cruelty they bewailed in songs of lamentation (*planes*), or whose death they mourned in sorrowful threnodies. Although the 'love-service' of the troubadours was often nothing more than an artificial gallantry, having more *esprit* than heart in it, yet not unfrequently the sport passed into fatal earnest, and adultery, murder, and revenge were the consequences.

Further, when, as often happened at great court-festivals, several troubadours were present, the latter used to indulge in competitions or verse-battles (*tensons*) among themselves, for the gratification of the high society assembled there; mostly on questions selected by the ladies from the 'Laws of Love;' one or more of these ladies sitting as umpires at such poetic jousts, and deciding who were the victors. But although the troubadours as a rule monotonously confined themselves to themes of gallantry, yet sometimes their muse, especially in its satiric moods, ventured into higher regions, and glanced at the general conditions of society, or the graver evils of the times—as the wars between the English and French armies in Southern France; the persecution of the Albigenses; the degeneracy of the clergy; the diminishing zeal for the Crusades, &c.; or they even descended to depict the life of the peasantry, and sang their adventures with shepherdesses, &c. in *pastoretas* and *vaqueyras*. The most illustrious patrons of the troubadour poetry were the counts of Provence, particularly Raimund Berengar III. (1167—1181), Alphonse II. (1196—1209), and Raimund Berengar IV. (1209—1245); the counts of Toulouse, as Raimund de St Gilles, who joined the ranks of the Crusaders in 1096, Raimund V. (1148—1194), and Raimund VII. (1222—1249); Richard *Cœur de Lion* of England, himself a troubadour; Eleanor, wife, first of Louis VII. of France, and afterwards of Henry II. of England; Ermengarde, Viscountess of Narbonne; the kings of Aragon, as Alfonso II. (1162—1196), Pedro II. (1196—1213), and Pedro III. (1276—1285); the kings of Castile, as Alfonso IX. (1188—1229), and more especially Alfonso X. (q. v.), surnamed the Wise; several Italian princes, as Bonifacio, Count of Montferrat, and after 1204 king of Thessalonica, and Azzo VII. of Este (1215—1263). These names also indicate the extent of territory on which the troubadour poetry was cultivated—viz., Provence, Toulouse, Poitou, Dauphiné, or briefly France south of the Loire; Catalonia, Valencia, and Aragon in Spain; and part of Upper Italy. It lasted for about 200 years (1090—1290), and one can distinguish three periods in its history: (1) The period of its genesis or birth, or its development out of mere popular minstrelsy into artistic poetry (1090—1140); (2) its golden age (1140—1250); (3) the period of its decline (1250—1290). The first of these periods is marked by a conscious striving after something finer and more poetic than the rude simplicity of the earlier verse; the second, by the loftiest expression of ideal chivalry and gallantry, and the most perfect development of artistic form; the third, by an ever-increasing serio-didactic tendency, and a degeneracy in poetic art. Thus the poetry of the troubadours rose, and ruled, and fell with that courtly chivalry which was at once its inspiration and its soul.

The long list of troubadours begins with GUILLEM IX. Count of Poitiers (1087—1127), the earliest of whom we have any knowledge, and whose verses exhibit partly the popular ballad style, and partly a more elaborate mode of poetic conception. His life and works appear to have been equally immoral.—After him comes BERNARD DE VENTADOUR (1140—1195), one of the first poets of the golden age of troubadour-minstrelsy. He was the son of a poor serf of the Vicomte Ebles II. of Ventadour. Recognising the talent of young Bernard, his master encouraged and assisted him; but his poetic enthusiasm was more excited by his passion for Ebles's wife, Agnes de Montluçon, than by Ebles's own commendations, and by the favour shewn him by later patronesses, Queen Eleanor, Joanna of Este, &c., all of whom he celebrated in fiery and delicate strains.—MARCABRUN (1140—1185), a foundling, was much feared for his power of satire, and was, in fact, murdered by the Castellan of Guian for an exercise of his fatal gift. He is reckoned the inventor of the art-song (*Cansós*). —JAUFRE RUDEL, Prince of Blaya (1140—1170), is equally famous for his languishing love-songs, and his romantic passion for the Countess of Tripoli, whom he never saw till he was at the point of death.—PEIRE D'AUVERGNE (1152—1215), son of a citizen of Clermont, called himself 'Master of the Troubadours;' yet his songs are more remarkable for their artistic finish than for their poetic inspiration.—GUILLEM DE CABESTAING (1181—1196), son of a poor knight, has become famous through his tragic love for the wife of his lord, Raimon de Roussillon.—RICHARD THE LION-HEART's song composed during his captivity in Austria, is widely known; and the songs of GUIRANT DE BORNEIL (1175—1220) have a manly and earnest ring about them; but perhaps the most celebrated of the whole fraternity was PEIRE VIDAL (1175—1215), a man wondrously endowed with poetic gifts, but who led so mad, wasteful, immoral a life, and committed such extravagant follies, that one doubts whether he was altogether sane. He was the terror of husbands.—BERTRAND DE BORN (1180—1195), equally celebrated as warrior and poet, played an important part in the wars of Henry II. of England with his rebellious sons, and was a zealous French patriot. His songs are for the most part of a political cast, full of martial ardour and the love of fatherland. In his lifetime, men dreaded his sharp tongue no less than his keen sword.—FOLQUET DE MARSEILLE (1180—1231) was the son of a Genoese merchant established at Marseille. After wasting his youth in amorous gaieties, in a fit of grief for the death of one of his many mistresses, he entered the church, rose to the dignity of Bishop of Toulouse, and signalised himself by the fanatical zeal with which he persecuted the Albigenses. Folquet's songs, 25 in number, are of an impassioned nature.—RAMBAUT DE VAQUEIRAS (1180—1207), a native of the county of Orange, in the south of France, was the son of a knight, and so great a favourite with Bonifacio II., Marquis of Montferrat, that the latter positively tolerated his sister's intimacy with the poet. He accompanied his patron to the East, and probably fell with him fighting against the Bulgarians. Some of his songs have found their way into different Romanic tongues.—PEIROT (1180—1225), in his condition and fortunes, curiously resembled his contemporary just mentioned. His pieces rank among the finest love-songs of the troubadours.—The MONK OF MONTAUDON (1180—1200) is a poet whose proper name is not known. He was sprung from a noble family belonging to Auvergne, and became Prior of Montaudon, but, notwithstanding, led the free life of a wandering poet. Finally, he betook himself to the court of Aragon; Alfonso II. made him Prior of Villafranca, where he died. He was more renowned for his satire than for his sentiment, and his songs are full of personalities directed against his brother troubadours—very cynical and very caustic.—ARNAULT DANIEL (1180—1200), a nobleman of Riberac, in Périgord, whom love made a troubadour. His powers of invention have been highly praised. Petrarch calls him *il grande maestro d'Amore*. Dante also celebrated his genius. —GAUCELM FAIDIT (1190—1240), son of a burgher of Uzerche, in Limousin, led at first, with his wife Guillelma Monja, the free and pleasant life of a jongleur; but subsequently left her, and became enamoured of the Countess Marie of Ventadour, who made him her troubadour. He would fain have been her paramour also, but she was too prudent; and so, to revenge himself, he carried on intrigues with other women; but his sweetest songs were those he sang in his lady's praise.—RAIMON DE MIRAVOL (1190—1220), one of the most lovable of the troubadours, although the women —his spouse not excepted, who was herself a poetess —abused him so bitterly, that for two years he was out of his mind.—SAVARIE DE MAULEON (1200—1230), a French baron, became Grand Seneschal of Aquitania, and took part with Raimund of Toulouse against Simon de Montfort. His political career was marked by great vacillation. As a poet, he is noted for his *Tenzone*.—PEIRE CARDINAL (1210—1230), son of a knight, was intended for the church, but preferred the life of a troubadour, and travelled with his jongleur from court to court. Jago I. of Aragon was his great patron. He was a master of the moralistic *Sirventes*, and assailed—but only with a sort of generalised satire—the nobles and clergy.—The last representative of the troubadours was GUIRAUT RIQUIER (1250—1294), a native of Narbonne. Although he had in his time many patrons, of whom the most distinguished was Alfonso X. of Castile, he was often in sore need; and his poems, full of complaints of the disrepute into which his order had fallen, may be regarded as the swan-song of troubadour poetry.—See Diez, *Leben und Werke der Troubadours* (Zwickau, 1829); Fauriel, *Histoire de la Littérature Provençale* (3 vols., Par. 1846); Galvani, *Osservazioni sulla Poesia de' Trovadori* (Modena, 1829), and *Fiore di Storia letteraria e cavalleresca della Occitania* (Milan, 1845); De Laveleye, *Histoire de la Langue et de la Littérature Provençale* (Brüss. 1845); Mahn, *Die Werke der Troubadours* (Berl. 1846); and *Die Biographien der Troubadours* (Berl. 1853); Brinckmeier, *Blumenlese aus den Werken der Troubadours* (Halle, 1849), and *Rügelieder der Troubadours* (Halle, 1846), Kannegiesser, *Gedichte der Troubadours* (Tüb. 1852), and *Ungedruckte Provenzal Lieder von Peire Vidal, Bern. de Ventadour, Folquet de Marseille, und Peirol d'Auvergne* (published by Delius, Bonn, 1853).

TROUS-DE-LOUP, or WOLF-HOLES, are hidden holes about 6 feet deep, and 4½ in diameter at the top. They are funnel-shaped, and have one or more pointed stakes at the bottom. They are placed often thickly about the glacis and approaches to a fortress; the object being to break the ranks and otherwise disorganise an attacking force.

TROUT (Fr. *truite*, from M. Lat. *tructa*, which, according to Diez, may be from Gr. *troktes*, the name of a voracious sea-fish, derived from *trogo*, to eat), the popular name of many species of the genus *Salmo*, as characterised by Cuvier, some of which are referred by Valenciennes to his restricted genus *Salmo*, some to *Fario*, and some to *Salar*. See SALMON. The name is given to some of the silvery

species, migrating to the sea, and to all the yellow species, which constantly inhabit fresh waters. The former are noticed in the article SALMON, the present article is devoted to the latter.

Trouts are found in almost all the lakes and rivers of the temperate and colder parts of the northern hemisphere. The COMMON T. (*Salmo fario* or *Salar Ausonii*) is widely diffused in the eastern hemisphere, abounding in almost all the lakes and rivers of the British Islands and the north of Europe. It is found even in very small streams, and almost to their mountain sources, but attains its largest size where there is considerable depth of water and abundance of food. An instance is on record of a T., caught in England, in a branch of the Avon at Salisbury, weighing 25 lbs.; but such a size is very rare, and even in ponds where the T. are regularly fed, they seldom exceed 10 lbs. A trout of 1 lb. or 1½ lb. is reckoned by the angler a very fine fish; and many a stream swarming with T. produces none nearly so large. The head of the Common T. is large; the eye large; the general form symmetrical, stouter than that of the salmon, the convexity

Common River Trout (*Salmo fario*).

of the outline of the back nearly similar to that of the belly; the tail is slightly forked, except in old fish, in which it becomes almost square, and sometimes even slightly convex. The teeth are numerous, strong, and curved; two rows of them extending along the whole length of the *vomer*, with no marked group at its front. The colour is more or less yellow, but the tint varies much in the T. of different waters, sometimes passing into greenish black or violet. The colour is brightest in the T. of clear streams. On the back and upper part of the sides there are numerous spots of black and red; the belly is silvery white. The spots on the sides vary much. The fins are light brown; the dorsal fin and tail with numerous darker brown spots. The varieties which the Common T. exhibits in tints and spots, has led to the supposition that several distinct species have perhaps been confounded as one, and attempts have been made to point out their characters; but these have not proved satisfactory to the greater number of naturalists. It is certain that the appearance of the T. is much affected by the character of the water in which it lives, and the food with which it is supplied. The T. of a river with a muddy bottom are very different from those of a clear stream, and those of a stream darkly coloured by moss are easily distinguished. The tint of the flesh varies as well as the external colours, being pink in some—the finest for the table—and white in others. It has been found that T. transferred from one locality to another soon change their tints.

The T. is very voracious, and readily devours almost any kind of animal food. Worms and slugs washed into rivers by rains are very acceptable to it. Small crustaceans are supposed to be the chief food of T. in some lakes and streams which are noted for the excellence of their produce. Small fresh-water shell-fish are also a favourite food of trout. Small fish of any kind which they can capture are their prey, and multitudes of salmon-fry thus perish. A gentleman well known to the writer of this article caught a large trout which had a very young viper in its mouth, bitten into three pieces; not yet swallowed, probably, because there was not room for it in the over-gorged stomach. The leaping of T. for flies in a summer day or evening adds to the charm of many a rural scene. Small T. often throw themselves quite out of the water; the larger ones in general merely rise to take struggling flies from its surface. The angler adapts his lures to the season and the weather. In spring and summer, when the weather is fine, the artificial fly is very successful; bait, generally the worm, is used in wet weather, or when the streams are much swollen by rains. The minnow is a good bait for large trout. No bait is more deadly than salmon roe, but the use of it is prohibited by law in Britain, for the sake of the salmon-fisheries.

The T. generally spawns in the end of October, when the lower jaw of the male becomes elongated, but not so much as in the salmon. The spawn is deposited in the same manner as that of the salmon, in gravelly beds, in running streams; and the T. of lakes ascend streams for this purpose. Where T. have no access to proper spawning-ground, recourse must be had to artificial means to increase the stock (see PISCICULTURE); but in many small streams their numbers seem incapable of being diminished by any amount of angling. The best feeding-grounds are often where there is no good spawning-ground within reach of the fish. The T. grows rapidly when it has abundant food. From instances of individuals kept in wells and ponds, it is known to attain an age of 30 or even 50 years.

Among the varieties of the Common T., one called the GILLAROO T. is found in Lough Neagh and other lakes of the north of Ireland. It attains a large size, is very thick in proportion to its length, and has much smaller teeth than the ordinary trout.

The LOCHLEVEN T. (*Salmo Levenensis* or *S. cæcifer*) is found in Loch Leven in Scotland, where the Common T. is also found, and is distinguished from it by

Lochleven Trout (*Salmo Levenensis*).

the more pointed pectoral fins; the much longer rays of the tail-fin, which is also more pointed at its extremities; and particularly by the number of the cæcal appendages, which are from 60 to 80 in the Lochleven T., whilst they do not exceed 46 in the Common Trout. The flesh of the Lochleven T. is not white or pink, but red. It attains a large size.

The GREAT LAKE T. (*Salmo ferox*) is the only other British species. It is found in some of the larger British and Irish lakes, and in the lakes of Scandinavia, seldom, if ever, ascending rivers, except for a short distance at the spawning season. It

attains a size of almost 30 lbs., is a very powerful, active fish, and tries the skill of the angler in no small degree. It differs from the Common T. in the longer muzzle, in the position of the fins, in having the tail square in all stages of growth, and in other characters. Its colour is generally deep purplish brown, passing into greenish or grayish yellow on the belly. The spots are large, and not numerous. The Great Lake T. feeds much on small

Great Lake Trout (*Salmo ferox*).

fishes, and is as greedy as a pike. It is taken by night-lines, or by trolling with strong tackle and a small trout or other small fish for bait. Young fish are taken with the artificial fly. The flesh of this species is very inferior in quality to that of the Common Trout.—Very different from it is the LAKE T. of the Lake of Geneva (*Salmo* or *Fario Lemanus*), which is a fish of excellent quality, and nearly allied to the Salmon Trout. See SALMON. It ascends the rivers which fall into the lake, as the Salmon T. ascends rivers from the sea.

North America has numerous species of trout. One of them, the COMMON BROOK T., or SPECKLED T. (*Salmo fontinalis*), is so similar to the Common T. of Britain, that it may almost be regarded as a variety rather than as a distinct species. It abounds in the streams of Canada and the more eastern British provinces, and in the northern and middle parts of the United States.—The NORTH AMERICAN LAKE T. (*Salmo confinis*) inhabits the deepest waters of the great lakes, and sometimes attains a weight of more than 60 lbs. It is dark-coloured, mottled with grayish spots. Its flesh is dirty yellow, and of very poor quality. It never takes the fly, but may be caught with the minnow, or a bait of fat pork. It is more sluggish than its congeners, and affords poor sport to the angler. There are several species of Lake T. in North America. The finest in quality, as well as largest in size, is the MACKINAW T. or NAMAYCUSH (*Salmo amethystus* or *namaycush*). It is not found in Lake Erie, nor in Lake Ontario, but in Lake Huron, Lake Superior, and the more northern lakes, even in those of the arctic regions. It inhabits the deepest parts of them, except in autumn, when it resorts to shallow water for spawning.—The SISKIWIT T. (*Salmo* or *Salar siscowet*) of Lake Superior is of large size, stout, thick, and of rich flavour, but so fat as to be almost unfit for food.—The RED-BELLIED T. (*Salmo* or *Fario erythrogaster*) of the lakes of New York and Pennsylvania, sometimes 2½ feet in length, is deep greenish on the back, lighter on the sides, which are spotted with red, the belly orange red.

The north-west of America has its own peculiar species of T., one of which, the OREGON T. (*Salmo trideus*), is found in almost every stream from the snowy peaks of the Rocky Mountains to the sea, and is very similar to the common T. of Europe.

TROUVÈRE, the name given in Northern France to the same kind of courtly or polished poet who, in southern France, &c., was called Troubadour (q. v.). Like the latter, he was usually attended by a jongleur, whose business it was to furnish an instrumental accompaniment to the songs which his master composed and sung. Sometimes, but rarely, the trouvère himself played on a harp. On the other hand, if minstrels and jongleurs were ambitious enough to aspire to original composition —as was the case, for example, with Adenez le Rois, Raymbert de Paris, &c.—they were nicknamed 'Bastard Trouvères' (*Troveor bastart*), or 'interloping rhymers' (*Contrerimoieurs*). This disdainful feeling of superiority was none the less likely to be strong that the poetry of the trouvères was high in favour at the northern courts, and that even kings and nobles were proud of the 'accomplishment of verse.' Among these princely and patrician amateurs were Thibaud of Champagne, king of Navarre, Jean de Brienne, Charles d'Anjou, Henri III. of Brabant, Pierre de Dreux, Count of Brittany, &c. The great patrons of the trouvères were the kings of France and England, the Dukes of Brabant, the Counts of Champagne, Flanders, &c.; while by the Anjou dynasty of the kings of Naples, their art was carried into Southern Italy, and by Henry of Burgundy into Portugal. The number of trouvères, in consequence, grew to be considerable; and one can still reckon the names and works of more than 150, of whom perhaps the most celebrated is the Castellan de Coucy.—See De la Rue, *Essais Historiques sur les Bardes, les Jongleurs et les Trouvères Normands et Anglo-Normands* (3 vols., Caen, 1834); Dinaux, *Trouvères, Jongleurs et Menestrels du Nord de la France et du Midi de la Belgique* (3 vols., Par. 1837—1843); Paris, *Le Romancero Français* (Par. 1833); Wackernagel, *Altfranz. Lieder und Leiche* (Basel, 1846), and *Collection des Poëtes Champenois* (Rheims, 1850).

TROVER, in the Law of England, is an action brought to recover goods from a person to whom they do not belong, but who has in some way obtained possession of them. It was founded on the old fiction, that the rightful owner had accidentally lost the goods, and the party in possession had found them, and would not give them up to such owner. It is practically an action to try the title to the goods, and therefore is of extensive application in the law of contracts, as well as other branches of law. The plaintiff, if successful, recovers the value of the goods as a satisfaction. The defendant is said to have illegally converted or appropriated the goods, and it is by the conversion of the goods that the damage is done, and for which the remedy is given.

TROWBRIDGE, a market-town of Wiltshire, stands on a rocky eminence in the valley of the river Biss, 10 miles south-east of Bath. In the church of St James, which dates from the 14th c., Crabbe the poet officiated as clergyman from the year 1814 to 1832, and his remains repose under a monument in the chancel. The town has long been the seat of woollen manufactures, and these, within recent years, have been carried on with much spirit and success. Cassimeres, kerseys, tweeds, and woollen cloths of the best qualities are manufactured. Many handsome villas have been erected outside the town by the wealthy manufacturers. Pop. (1881) 11,041.

TROY. The earliest traditions of the Greek people, as contained in their oldest poetry and history, represent the country on both sides of the Ægean as peopled by various races, either of genuine Hellenic, or of closely affiliated tribes. Among those who peopled the eastern or Asiatic coast are specially named the Pelasgi, the Leleges, the Caucones, the Carians, the Lycians, and the Trojans. These last, to whom Homer's poem has given a celebrity that throws all the rest into the shade, occupied the small country in the north-west corner of Asia Minor, best defined, perhaps, as the

region of Mount Ida, with its topographical dependencies. That the Trojans were either a Greek race, or some non-Hellenic people under a Greek dynasty, seems probable, from the absence in Homer of any such decided national contrast between Greeks and Trojans, as we find in medieval poetry between Christians and Saracens. Local legends represented them as closely connected with Crete; and Homer in the *Iliad*, xx., makes Priam the sixth in descent from Dardanus, the first of the dynasty, who was supposed to have come from Crete. The story of the Trojan war, which forms the subject of Homer's great poem the *Iliad*, is extremely simple. The Trojans, in the person of Paris, or Alexander, the son of the reigning monarch, Priam, are represented as having had certain dealings with the Achæans, or Greeks of the Peloponnesus, in the course of which the gay young prince carries off from the palace of Menelaus, king of Sparta, his spouse Helen, the greatest beauty of her age. To revenge this insult, the Greeks banded themselves together, and sailed against Troy with a large fleet. All the Greek tribes afterwards famous in history took part in this expedition; but the most notable were the Argives or Achæans—Greeks of the east and north part of the Peloponnesus, and adjacent isles; the Spartans—Greeks of the south-east district of the Peloponnesus; the Neleids—Greeks of the west coast of the Peloponnesus; the Bœotians, and the Thessalians. Of the Thessalians, the most prominent captain was Achilles; and the general command of the whole expedition was committed to Agamemnon, king of Mycenæ, as the head of the most numerous contingent, and at the same time the brother of the royal person whose hospitality had been so grossly violated. This well-appointed European army is represented as having spent nine years in besieging the god-built walls of the city of Priam without making any impression on its strength. A violent quarrel between Achilles and Agamemnon, breaking out in the tenth year, so weakened the invading force, that the Trojans, under Hector, pushed the Greeks back to the very verge of the sea, and almost set their ships on fire. This quarrel forms the subject of the *Iliad*. At the critical moment, however, the Thessalian captain is reconciled to the head of the expedition; and with his return to the field, the fortune of war changes; Hector, the champion of Troy, falls, and the impending doom of the city is darkly foreshadowed. The siege and sack of Troy did not fall within the plan of Homer's poem, but are narrated at length in the *Post Homerica*, a Greek poem by Quintus Smyrnæus, a poet of the decadence. The Greeks possessed a long series of popular poems called the Cyclic poems, in which the whole sequence of the Trojan story was narrated, giving completeness to the brilliant fragment, which has been adorned by the genius of Homer. From these poems—of which the abstracts are still preserved—Virgil derived those materials which he has used with such effect in the second and third books of his great poem. The Cyclic poems, besides the events in the Trojan war after the death of Achilles, contained an account of the various colonies in Italy and elsewhere believed to have been founded by the scattered chiefs of the expedition after their return home. Of these, the settlements of Diomede, Philoctetes, and Idomeneus, on the south-east coast of Italy, and that of Æneas on the banks of the Tiber, are the most famous. The chronology of the Trojan war, depending as it does mainly on artificial construction from genealogical data, is not, of course, trustworthy; but there are good reasons for believing that the generally received date of 1184 B.C. is not far wide of the mark. After the fall of the kingdom of Priam, the future story of Troy is short and uneventful. Under the Lydian kings, whose dynasty culminated in Crœsus, a New Troy—*Ilium Novum*—began to creep into notice, which, from the glory that belonged to its name, and the favour of Alexander the Great, Julius Cæsar, and other influential visitors, grew into some significance. The interest which attached to it, however, in its most flourishing estate was more antiquarian than political.

How far the events of the Trojan war, as found in Homer and the Cyclic poets, are to be taken as historical, depends upon the view which is taken of the general character of the materials of popular ballad poetry in all countries. That there is in the general case an under-stratum of historical reality, out of which the earliest popular poetry grows, may be assumed as certain. But how strong the tendency is, in early uncritical ages, to erect on this foundation a purely imaginary superstructure, need scarcely be mentioned. At the same time, there is a very great difference to be observed in the popular poetry of different nations, in respect of the greater or less amount of trustworthy historical matter which lies embedded in the imaginative conglomerate. The excess of the imaginative, fanciful, and altogether improbable element, is found in our own Arthurian and Carlovingian romances. In Homer, on the other hand, there is a sobriety of tone, a geographical clearness, and a general air of verisimilitude, which incline the reader to accept the historical reality of the main facts. In the first chapter of Herodotus, we find the Phœnicians practising the very same act of abduction, though in a more violent form, which the poet represents as having kindled the famous ten years' warfare between Greece and Troy; and even in the most general view, the war of Troy between rival peoples on the opposite sides of the Ægean, may be looked on as the natural overture of those great struggles, by which, on the same theatre afterwards, the fate of the world, indicated by the preponderance of the European over the Asiatic element, was more than once decided.

The PLAIN OF TROY is formed by the débris of the great chain of mountains which terminates the peninsula of Asia Minor on the north-west, where it is separated from Europe by the Sea of Marmora and the narrow strait of the Dardanelles. This chain of mountains is called Ida by Homer (*ide*, wood); and its highest peak towards the south side of the Troad, overhanging the Bay of Adramyttium, is celebrated by the same poet as Gargarus. Westward from this chain, the land slopes gradually down by a series of undulating ridges to the south coast of the Dardanelles. The plain included between these ridges and the sea is the plain of Troy. It is surrounded on all sides by elevated ground, by hills and mountains towards the east and south-east, and by rocky ridges or cliffs along the coast. At one place only does it open to the sea, and this is at the extreme north-west corner, where it meets the south end of the Dardanelles. Here there is a stretch of sandy shore about two miles in length, beginning behind the Turkish fort of Koumkale, and trending eastward. This is the only place where a fleet such as that described in the *Iliad* could effect a permanent landing; and here, accordingly, by general consent, the encampment of the Greeks is placed. The promontory which bounds this bay to the east is universally acknowledged as the Rhætean promontory of the ancients, while that on the west is the Sigean. Here, also, as the natural mouth of the plain, the principal river, by whose action mainly it was formed, finds its way into the sea. This river is the Mendereh, obviously a corruption of the Homeric

Scamander, called also by the poet Xanthus, from *xanthos*, that is, the *yellow* river, from the colour of its waters; a quality which has been noticed by most modern travellers. Looking up the plain from any of the heights about the mouth of the river in a south-easterly direction towards Gargarus, its course can be easily traced to a distance of about nine miles, where it emerges into the plain through a defile in the mountains. This distance of nine miles, therefore, is the extreme length of the plain of Troy. Its breadth is about three miles. It presents the appearance of 'a long tract of meadow-land, enclosed within a girdle of low, round-backed hills, and prettily garnished by many lines of trees, which skirt the water-courses.' These waters, with the single exception of the Scamander, are not large enough, according to our usage, to deserve the name of rivers, but are mere mountain-torrents or brooks, generally dry in summer, some of them nothing better than a sort of natural drains or ditches. Those deserving of mention are three: the first flowing from the chain of Ida westward into the plain, about three miles from the sea, called the *Dombrek;* the other in the same direction, about five miles further up, called the *Kimair.* The third streamlet rises at the head of the plain, near the Turkish village of Bunarbashi, and creeping along the bottom of the slope towards the Archipelago, forms the boundary of the plain on the west, and empties itself into the Mendereh, about two miles above its mouth. One of these streams must be the Homeric Simois.

The topography of a plain so famous in the history of human civilisation has, of course, occupied the attention of the learned both in ancient and modern times; and a considerable library could be formed of volumes in which this region has been described, and its most famous localities discussed. The topographical result of these voluminous discussions can, however, now be given in a very few sentences. In the first place, after seventy years of confusion and hallucination, it may be regarded as certainly established, that the Mendereh is the Scamander. It is also universally allowed that *Novum Ilium*, or New Troy, occupied the site of Hissarlik, on an eminence about four miles from the mouth of the river, on its right bank, near the bend of the Dombrek. It is also a matter of general consent, that the great tumulus or barrow, near the Sigean promontory, where the Dardanelles broaden up into the wide Ægean, is the veritable monument of Achilles, described by Homer in a famous passage of the *Odyssey;* but beyond these three points, it cannot be said that any part of the classical topography of the plain has been ascertained with certainty. The great point to determine, of course, is the site of the Homeric Troy, the capital of the empire of Priam; but this is a matter which, in default of inscriptions, can be ascertained only by previously deciding which of the three streamlets above mentioned is the true heir to the legendary glories of the Homeric Simois; for between the Scamander and the Simois the tide of battle rolled to and fro, as Homer expressly tells us; and at the head of the plain between these two rivers the town of Troy must certainly stand. Those who hold with Strabo among the ancients, and Maclaren among the moderns, that the Dombrek is the Simois, have strong grounds for maintaining that New Troy was built upon the site of Old Troy, and that no further search is necessary; while they who look on this point as suspicious, must recognise the Simois in the river of Bunarbashi, and the site of the Pergamus of Priam on the plateau at the great bend of the Scamander, about a mile to the eastward of the village of Bunarbashi, where the substructions of an ancient city have been lately excavated. Those who wish to see this nice topographical question discussed in the most masterly style, will read *The Plain of Troy Described*, by Charles Maclaren (Edin. 1863), on the one side; and *Ueber des Homerische Ilion*, by Professor Welcker, in his collected tracts (Bonn, 1845), on the other. A succinct exposition of the arguments on both sides will be found in Professor Blackie's notes to the *Iliad*, Book xxi. The literary history of this topographical question, commencing with the work of Le Chevalier, a Frenchman, translated into English by Professor Dalzel in 1791, is extremely curious; but the most distinguished scholars and topographers being now agreed that the Mendereh and the Scamander are identical, it is not necessary to make any allusion to the wonderful discovery of 'the wells of the Scamander,' by which Le Chevalier imagined he had made himself immortal. Dr Schliemann, who lately carried on a systematic investigation of the supposed neighbourhood of ancient Troy, believes he has found at Hassarlik its veritable site. In July, 1872, he discovered a very large collection of gold, silver, and copper implements, undoubtedly of great antiquity. He considers that these are part of the treasures of ancient Troy, probably buried for safety on the night of the conflagration.—See *Troy and its Remains*, by Dr Henry Schliemann, London, 1875.

TROY, a city of New York, U. S., on the east bank of the Hudson River, at the head of steamboat navigation and tide-water, 151 miles north of New York City, and 6 miles north of Albany, built upon the alluvial flats of the river and hills, called Mount Ida, on the east side. Winants Kill and Poesten Kill, two small streams, having each a series of falls, furnish water-power to mills and factories, besides that given by a dam across the Hudson. At T. is the principal outlet of the canals connecting the Hudson with Lakes Champlain, Ontario, and Erie; and it has railway connections with New York, Boston, and the north and west. The Union Dépôt, in the centre of the city, is one of the largest in America, 60 trains arriving and departing daily. The iron furnaces and manufactories are among the largest east of the Alleghanies, being furnished with the magnetic ores of Lake Champlain, and the hematitic ores of Western Massachusetts. The coal is brought from Pennsylvania and Maryland. The chief iron-works are those for bar-iron, railway-spikes, nails, locomotives, stoves, hot-air furnaces, hollow ware, machinery, agricultural implements, &c. Other important manufactures are those of railway cars, coaches, omnibuses, cotton and woollen goods, breweries, distilleries, flour, boots and shoes, shirts and collars—the latter employing 4500 persons, with extensive machinery. There is also the largest manufactory of mathematical instruments in the country. The property which reaches tide-water by the canals centering at T., including lumber, is valued at 17,000,000 dollars annually. The city contains 33 churches, 28 public schools; the celebrated Female Seminary founded by Mrs. Emma Willard, the Rensselaer Polytechnic Institution, with 14 teachers and 100 students; asylums, academies, &c. T. was settled by the Dutch in 1752, and incorporated as a village in 1801. Three times it has been nearly destroyed by fire; in 1862, the loss amounted to 3,000,000 dollars. Pop. (1840) 19,334; (1850) 28,785; (1860) 39,235; (1870) 46,465; (1880) 56,747.

TROYES, a town of France, formerly capital of the province of Champagne, and now of the dep. of Aube, on the left bank of the river Seine, 103 miles east-south-east of Paris by railway. It is a very old-fashioned place, and most of the houses are of

wood. The principal buildings are the cathedral, dedicated to St Peter, a splendid specimen of *flamboyant* Gothic, founded in 872, and rebuilt between the 13th and 16th centuries; the churches of St Urban, the Madeleine, St Pantaleon, and St Remi, the Hôtel de Ville, a public library, containing 53,000 vols. and 5000 MSS.; a Museum, the Palace of Justice, the Exchange, Merchants' Hall, and various educational institutions. T. is not so populous or important as it was in the middle ages. Even as late as Henry IV.'s time, it had more than 60,000 inhabitants; in 1881, the pop. was 45,824. It carries on numerous cotton and woollen manufactures, and, as the centre of a rich agricultural region, it has a large transit-trade.

T., anciently the capital of the Celtic Tricassii, was called by the Romans *Augustobona;* later, *Civitas Tricassium;* and then *Trecæ* (a corruption of Tricassii), whence the modern Troyes.

TROY-WEIGHT. The origin of the term 'Troy' is unknown; some consider it to be a corruption of *le roy*, as the troy pound was, till recently, the standard pound (*pondus regis*); some derive it from *Troy novant*, the monkish name for London; while the majority of philologists and lexicographers profess to see the origin of the name in the town of *Troyes*, in France, an important centre of commerce during the middle ages, which hence *may*, like the towns of Cologne, Toulouse, and others, have had its own special system of weights; though why the term should have migrated to Britain, and been exclusively employed there for so long, is not at all evident. A Troy pound (of what value is unknown), is first mentioned in Britain in 1414, long before which period the standard pound of 12 oz., as well as another pound (the Tower pound) of 12 oz., was in use. The term 'Troy' was first applied to the standard pound in 1495, but at the same time no change seems to have been made in its value, and it continued, as before, to be exclusively employed by the dealers in the precious metals, gems, and drugs. See POUND. The troy pound contains 12 oz., each ounce 20 penny-weights, and each penny-weight 24 grains; thus the pound contains 5760 grains, and is to the avoird. pound as 144 to 175; while the troy ounce is to the avoird. ounce as 192 to 175. For medicines, the troy pound is divided into 12 oz., each ounce into 8 drachms, each drachm into 3 scruples, and each scruple into 20 grains. The old English pound, to which the term Troy was afterwards applied, was doubtless the pound of silver; and the Tower pound of 12 oz. differed from it only by ¾ths of an ounce.

TRUCE, a suspension of hostilities between two armies or states for a period specially agreed upon. During a truce, it is dishonourable to occupy more advanced ground, or to resort to any act which would confer advantage. A truce requires ordinarily to be confirmed by the commander-in-chief to become binding. It is lawful to break it before the prescribed period, on notice previously agreed on being given to the opposite party. This is called denouncing a truce.

TRUCE OF GOD. See GOD'S TRUCE.

TRUCK-SYSTEM (French *troquer*, Scotch *trock*, to barter or exchange) is applied to the practice of paying workmen in goods instead of current money. There is no question about the bad social influence of such an arrangement in the ordinary staple and steady systems of productive industry, though there are cases where it is beneficial—as where new works bringing together large bodies of men are started in districts where there is little or no traffic. In such cases, an arrangement to supply the workmen from temporary stores established by their employers, or by persons in communication with them, will be better than leaving the families so collected at the mercy of miscellaneous speculators, probably insufficiently supplied with capital. The Truck Act of 1831 (1 and 2 Will. IV. c. 37) imposes penalties on the employer who pays in goods in certain producing trades. The feature which was supposed to be the supreme triumph of the act, however, and was to make it self-working, was, that all wages so paid were to be a blank. The workman so remunerated had still an action for his wages, and in various shapes it was provided that the goods should be no 'set off' against the money value of the labour. The Report of a Select Committee appointed in 1842 to inquire into the extent and operation of the truck-system, found that, notwithstanding the act, it flourished extensively in several productive trades—as in coal and other mines, iron-works, quarries, and various kinds of manufactories; and they reported that its prevalence had a very pernicious effect on the families of the working-men. In the year 1853, Mr J. H. Burton was employed by government to investigate the system as it operated in Scotland; and his Report of the results was presented to parliament. He found that, however pernicious it might be, it was a thing beyond legislative control, and that the attempts to suppress it, in many cases only strengthened its hold, by the completeness of the organisation for carrying it out. One, and a perfectly simple, form is this. At a large iron-work, say, the stated payment of the men is monthly. From their improvident habits, however, they are ever requiring advances. These are at once paid in cash. There is at the same time a neighbouring store; it may be owned by the same proprietors as the iron-work, or it may be let to some other person at a rent estimated, not at the value of the premises in the market, but at that of the trade which is guaranteed to the tenant. At this store, all purchases are made in cash, and all comers may purchase as at any other shop. The books of the two establishments, however, shew how much of his advances each workman has expended at this store. A man says he wants a pound in advance of his monthly wages. He gets the money, and no questions are asked. By comparison of books, however, it comes out how much of this is spent in the store. When he asks another advance, it may be refused, for reasons known to both parties, but not told. In some instances, the registers are so complete that when the workman pockets his advance, he knows, though he has never been told, what proportion of it he must spend at the store to keep in the advanced pay-list. It was found not unusual to limit the free expenditure to 5 per cent., or a shilling in the pound. Thus the system has its foundation in the improvidence of the class it affects. Until that disease is cured, and the workman can wait for the periodical pay-day, he must take his advances on the employer's conditions. As a general economy, the truck-system does not pay. If it is supposed to be profitable, it is from the fallacy, that two profits may be made on one capital. The capital which the iron-master devotes to dealing in beef, tea, and beer, must be subtracted from the capital embarked in his iron-work. This is the business to which he professes to devote himself, and for which he believes himself to have peculiar faculties. His truck-shop either diverts his attention from his main business, or he must hand it over to a hireling, who certainly will not work the capital so embarked as profitably as that portion employed in the iron-work, and superintended by the owner himself. But in great trades where truck is the established rule, the

individual employer cannot help himself. The rate of wages is adjusted on the scale of a portion coming back in the shape of the profit on purchases at the shop. The employer must therefore keep a shop, unless he can get his men to be so reasonable as to work for him on less wages than their neighbours nominally get; but he would be a person of miraculous reasoning powers who would persuade working-men to do that.

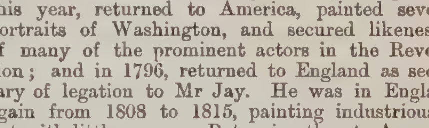
TRUFFLE (*Tuber*), a genus of fungi of the section *Gasteromycetes*; globose, or nearly so; of a fleshy substance, with a distinct skin, the whole substance pervaded by a network of serpentine veins, which are the *hymenium*, and bear the spore-cases in minute cavities. The species are not numerous; they are very generally diffused in temperate parts of the world; they are subterranean, often found at the depth of a foot or more in the soil. Some of them are amongst the most highly valued of esculent fungi. The COMMON T. (*T. cibarium*) is of a black colour, and has a warty surface. It varies in size from that of a large plum to that of a large potato. On account of its agreeable flavour, it is used in the preparation of many dishes. It is common in the central and southern parts of Europe, chiefly in loose soils, in woods and pastures, as in the chestnut woods of France and Italy. In England, it occurs, pretty abundantly, in the downs of Wiltshire, Hampshire, and Kent. Other species, as *T. æstivum*, *T. rufum*, and *T. moschatum*, are found in some parts of France, Italy, and other countries of Europe, and are sought after and used in the same manner as the Common Truffle. It has recently been discovered that the English species are more numerous than was formerly supposed; truffles have also been discovered in localities in the south of England where their existence was formerly unknown. The gathering of truffles is the occupation of many persons in the places where they abound. They are dug up with a kind of hoe or pick. Dogs are trained to seek them, and readily discover by the scent the spot where they grow underground. The stirring of the soil in the gathering of truffles seems to increase its productiveness. No particular kind of dog is specially employed for truffle-seeking; but one of which the parents are truffle-dogs is preferred, as it is said to be more easily trained. In some parts of France, pigs are also trained to seek truffles. In Germany, the name BLACK T. is given to the Common T., and that of WHITE T. to *Rhizophagon album*, a species of a nearly allied genus, which has also been found in England. It grows half above ground, is of a whitish-red colour, and is generally of the size of a large walnut. It is less aromatic than the Common T., but is used in the same way.

Truffle (*Tuber cibarium*).

TRULLAN, the name (derived from the hall—Gr. *troullos*—of the palace in which the Fathers assembled) given to the council also called *Quinisext* (q. v.).

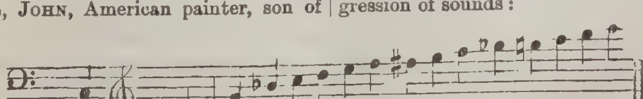
TRUMBULL, JOHN, American painter, son of Governor Jonathan Trumbull (said to have been the original 'Brother Jonathan') of Connecticut, and brother of General Jonathan Trumbull, aide-de-camp to General Washington, was born in Lebanon, Connecticut, 6th June 1756, was educated at Harvard College, and devoted himself to painting. He had completed two pictures, the 'Battle of Cannæ,' and the 'Judgment of Brutus,' at 19, when the war of the Revolution broke out, and he joined the provincial army before Boston as adjutant of the 1st Connecticut Regiment. The execution of drawings of the British works procured his appointment as aide to Washington, and soon after, that of brigade-major. In 1776—1777, he served under Gates and Arnold as adjutant-general; but, offended with the action of Congress respecting the date of his commission, he resigned, and resumed the palette. In 1780, he came to London, *viâ* France, where he was making rapid progress under the instructions of Sir Benjamin West, when, during the excitement occasioned by the execution of Major André, he was thrown into prison. The king, George III., promised West that his life should be spared, but he was kept eight months in prison, and then released on condition of leaving the kingdom. After the war, he returned, and resumed his studies. His 'Priam receiving the Body of Hector,' painted at this period, is in the gallery of the Boston Athenæum. In 1786, he produced the first of a series of modern historical and military works, the 'Battle of Bunker Hill,' followed by the 'Death of Montgomery,' 'Sortie of the Garrison from Gibraltar,' exhibited in London in 1789, and engraved by Sharp. He, this year, returned to America, painted several portraits of Washington, and secured likenesses of many of the prominent actors in the Revolution; and in 1796, returned to England as secretary of legation to Mr Jay. He was in England again from 1808 to 1815, painting industriously, but with little success. Returning then to America, he was employed by Congress to paint four large national pictures for the Rotunda of the Capitol at Washington—the 'Declaration of Independence,' 'Surrender of Burgoyne,' the 'Surrender of Cornwallis,' and the 'Resignation of General Washington, at Annapolis, December 23, 1783.' These pictures are chiefly valuable as collections of portraits. He afterwards completed a gallery of all his historical pictures, 57 in number, on a smaller scale, which became the property of Yale College, and has great historical value. He was the President of the American Academy of Fine Arts from its foundation in 1816, until the formation of the National Academy in 1825; and died in New York, November 10, 1843.

TRUMPET, a musical instrument of great antiquity, which, in its present form, consists of a



Trumpet.

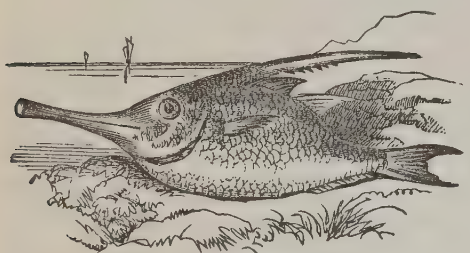
tube eight feet long, less in diameter than the horn, doubled up in the form of a parabola, and sounded by a mouth-piece. It produces the following progression of sounds:



Music for the trumpet, as for the Horn (q. v.), is written in the key of C, the key to which the instrument is to be adapted being pointed out by the composer. The pitch is an octave higher than that of the horn. Trumpets in the keys of C, D, and E♭ are most used; but there are also trumpets in A, B♭, E, F, and G. To enable the trumpet to give a complete series of semitones, finger-keys and sliding tubes have been introduced by some makers, rather to the detriment of the freshness and fulness of tone of the instrument.

TRU′MPETER, a soldier in a cavalry regiment, whose duty it is to re-pronounce or pass on the orders of the commanding officer; for which purpose certain recognised simple tunes have arbitrary meanings attached to them.

TRUMPET-FISH, or SNIPE-FISH (*Centriscus*), a genus of fishes of the family *Fistularidæ*, remarkable for the elongated and tubular snout. The



Trumpet-fish (*Centriscus scolopax*).

only British species (*C. scolopax*), rare on the British coasts, but abundant in the Mediterranean, attains a length of about five inches, the snout projecting about an inch and a half in front of the eyes. The mouth is destitute of teeth. This little fish is esteemed a delicacy, and is often to be seen in the markets of Italy.

TRUMPET FLOWER, the popular name of certain flowering shrubs of the genera *Bignonia* and *Tecoma*, both of the natural order *Bignoniaceæ* (q. v.). *Bignonia capreolata* is a native of the southern states of America, but often planted in shrubberies and gardens in the middle states. It is a climbing shrub with conjugate leaves and heart-shaped oblong leaflets. The flowers are reddish-yellow, with a long tubular corolla, from the form of which the English name is derived.—*Tecoma radicans* (formerly *Bignonia radicans*) is also a climbing shrub, and a native of the southern states of America, reaching to a more northern latitude than the last. It has much larger flowers, of a scarlet colour. The leaves are pinnate, the leaflets ovate and toothed.—*T. grandiflora* is a native of Japan, with pinnate leaves and flowers much larger than *T. radicans*. Both are cultivated with success in the open air in England.

TRU′NNION. See GUN.

TRU′RO, a municipal and parliamentary borough and seaport of Cornwall, of which county it is considered the metropolis, though Bodmin (q. v.) is the county town, 8 miles north-north-east of Falmouth. It stands at the junction of two rivers, the Allen and the Kenwyn, which are here met by an inlet of the sea called the Truro river, the banks of which present some beautiful scenery, and which admits of vessels of 100 tons burden passing upward to the quays of the town. T. is the centre of a mining district, and largely exports tin and copper ore. St Mary's Church, a Perpendicular edifice of the reign of Henry VII., is the principal building. Pop. (1881) 10,663.

TRUSS, an instrument employed in the palliative treatment of Hernia (q. v.), with the view of preventing its descent, and, in some cases, of effecting a permanent cure. It consists essentially of a pad or cushion attached to a metallic spring, with straps so arranged that its position may be retained during the varied postures of the body. The necessity of having recourse to a suitable truss the moment that the slightest protrusion shews itself in any of the parts liable to hernia cannot be too strongly urged as a matter of necessary general knowledge. At whatever period of life a hernia occurs, if properly attended to, and judiciously supported, it usually gives little trouble, and if it occurs in early life, it may often be cured; whereas, if it be neglected, increase of bulk, and subsequently, diseased states of the parts, often terminating in death, will almost certainly occur. A surgeon should always be consulted in the choice of the instrument. 'The practice,' says Mr Birkett, 'of leaving cases of rupture in the hands of mere tradesmen cannot be too strongly censured. Amongst the poor, we constantly observe the lamentable effects of this proceeding.' Many varieties of trusses have been invented. Mr Kingdon, surgeon to the City of London Truss Society, considers that the 'circular spring truss' is the most suitable form in the majority of cases. There are occasional cases in which the common truss fails to support a rupture comfortably, and in these cases various instruments, for the most part the property of special instrument-makers, are often serviceable; and the surgeon should be acquainted with the peculiarities of the pieces of apparatus known as the Mocmain Lever Truss, Coles's Truss (with a spiral spring acting on the pad), Salmon and Ody's Self-adjusting Truss, Eggs's Truss, &c. The patient must expect to find the truss somewhat uncomfortable for a week or two, but will soon get used to it. The skin of the part upon which it presses should be regularly washed and bathed with Eau de Cologne, or spirit, as, without this precaution, boils are apt to form on it.

TRUSS. See CONSOLE. Also the framework, composed of tie-beam, rafters, struts, &c., forming one of the principal supports of a roof.

TRUSSING, in Ship-building, diagonal timbers or iron plates crossing the ribs internally, and consolidating the whole together. Iron is preferred to wood, as being less heavy and less bulky.

TRUST, in the Law of England, is a confidence reposed in some other person touching land or goods for which the *cestui que trust*, or beneficiary, has no remedy except in the Court of Chancery. In more popular language, it means a species of divided proprietorship, whereby the trustee acts as a custodier or strong-box; and yet the benefit of the property is not his, but belongs to the *cestui que trust*. The person who creates the trust is sometimes called the *celui que trust*. As a general rule, all property, whether real or personal, may be made the subject of a trust, provided some policy of the law or statute does not prevent it. Trusts are most frequently created by a will; but they may be declared by word of mouth as regards personalty, while as to land, some writing is necessary. No particular words are necessary, but the intention of the party making the trust must be clear. Thus, in wills, a testator sometimes uses words which do not amount to an express trust, but speaks of his 'wish and desire,' or his 'confidence,' that the executor or trustee shall do certain things. These words are called in the law precatory trusts, but are enforced

in the same way as more direct language, if no uncertainty exists as to the purposes or mode of carrying out the trust. But if a testator merely recommends an executor to 'consider certain persons,' 'to be kind to them,' or 'to do justice to them,' or 'to make ample provision for them,' &c.—such expressions are treated as too vague to be binding, and therefore the executor may disregard them, or use his own discretion. A trustee's is not a compulsory office, but gratuitous, and therefore he need not accept the office unless he pleases. But if he once accept, he is not at liberty afterwards to renounce, unless the trust-deed contain a provision enabling him to do so, or the Court of Chancery for good reasons discharge him. A trustee cannot delegate the office to a third person, but continues personally bound to do his duty. Where there are several trustees appointed, the office is considered joint, so that if one dies, the survivors continue to exercise the office. As a general rule, all must join in doing any act; but if the trust is of a public nature, a majority may bind the minority. Each trustee is liable only for his own acts or defaults, and this is so even though, for form's sake, he join his co-trustees in signing a receipt, if he can shew that he never received the money in point of fact. Nevertheless, when money lies in the hands of one trustee, the others ought not to be satisfied with his mere statement that the money has been invested by him, but should see that it is actually done. Another rule is, that a trustee is not allowed to make a gain of his office; and so jealous is a court of equity of this rule, that the trustees of a large estate are not even allowed to sport over the estate—at least so as thereby to keep any valuable right of that kind for their own pleasure. Hence, a trustee is personally liable if he trade with the trust funds, or buy shares in a joint-stock bank; for even though the trust-deed authorise this to be done, he will be liable to pay the debts of the trading concern, though far exceeding the amount of the trust funds. So, if a trustee is a solicitor, and does legal business for the estate, he will not be allowed to charge for his professional labours, but at most will be allowed only the costs out of pocket. It is seldom, therefore, that a trustee can get any benefit to himself from the trust estate, except in the rare case where the *cestui que trust* is dead without heirs, in which case the property will become the trustee's. This is, however, only so as to real estate; for if the trust estate consist of chattels, then, on the death of the *cestui que trust* without heirs or executors, the property goes to the crown, and not to the trustee. It is the duty of a trustee to keep the trust funds safe; and if they consist of moneys, then he ought to invest them in government stock, and not let the money lie unproductive. He is not entitled to lend the money on personal security, or in the shares of any private company; but he may invest in mortgages, unless he is forbidden by the deed or will. If there is, therefore, no power to invest in mortgages, the trustee must invest in three per cent. consols, and a few other government securities. The trustees, as a general rule, must pay interest whether they invest the funds or not (if they have had time to invest) to the *cestui que trust;* and they must account for all the profits they make with the trust funds, whether rightly or wrongfully. If a trustee has grossly misconducted himself as to the trust funds, he will be charged five per cent. interest, and sometimes with compound interest. A trustee is entitled to be indemnified for all the reasonable expenses or outlay attending the execution of the trust, but he must in general bear the loss of any mistake as to the law; but if there is any peculiar difficulty in carrying out the trust, he is entitled to take the opinion or, or even to throw the chief management upon, the Court of Chancery, as the only safe protection. When trustees are guilty of gross negligence, mismanagement, or misconduct, the Court of Chancery will remove them, and appoint others.—In Scotland, there are several technical points of difference from the above in the law of trusts.—Paterson's *Comp. of English and Scottish Law*, s. 201. The chief practical difference is, that the investment of the trust funds in heritable securities or mortgages, is considered equivalent or superior to government security, and hence it is the duty of the trustees to prefer such securities, as, owing to the practice of registration of deeds affecting real property, heritable security is always a safe investment there.

TRUXI'LLO, a town of Spain, province of Cáceres, on the great highway from Madrid to Badajoz, and 80 miles north-east of the latter place, is built on a granite knoll, and is an old decaying town; but rising as it does in terraces from the road, it presents, at a little distance, rather a picturesque and imposing appearance. There are several churches and convents here. Pop. 6000, who are engaged chiefly in agricultural work. T. is the birthplace of Pizarro, who was also buried here in the church of Santa Maria de la Concepcion.

TRUXILLO, a town of Peru, province of Libertad, near the sea-coast, about 520 miles north-north-west of Callao. The port of T. is Huanchaco, about eight or nine miles to the north-west, from which considerable quantities of rice and spices are exported. Pop. 5000. T. was founded in 1535 by Pizarro, who named it after his birthplace in Spain.

TRYGON. See STING RAY.

TRYSAIL, a small fore-and-aft sail, mounted by

Trysail (*a*).

a cutter or schooner in a storm, when the wind is too violent for her to carry her ordinary canvas.

TSA'RSKO SE'LO (i. e., Imperial Town), a town of Russia, in the province of St Petersburg, and 13 miles south of the city of that name. It is the royal residence and favourite resort of the imperial family. The carriage-road from the capital to this town was constructed by the Empress Catharine at a cost of 1,000,000 rubles; but the *route* now preferred is that of the railroad—the first laid down in Russia. The façade of the great palace of T. S. is 1200 feet long. Originally, every statue, pedestal, and capital of the columns, vases, &c., was covered with gold leaf; only the dome and cupolas of the church are now gilded. The interior of the chapel is lavishly gilded, the ceiling being one sheet of gold.

There are several elegant rooms, though most of them are more remarkable for barbaric splendour than for taste. In the palace grounds, which are 18 miles in circumference, is an arsenal, containing a magnificent collection of armour, weapons, and accoutrements of all kinds. The imperial family no longer reside in the palace, but in a large building in the park. Pop. (in the year 1866) 10,173.

TSCHUDI, an ancient and noble family in the Swiss canton of Glarus, several members of which have distinguished themselves as authors, statesmen, and warriors. The two following are the most notable of the Tschudi. GILLES, or AEGIDIUS (born 1505, died 1572), who was active on the Catholic side during the struggles of the Reformation in Switzerland, and in consequence was forced for a time to leave his native canton (1562), but was permitted to return two years afterwards. He was a prolific writer, not less than 166 works of his, in print or in MS., being known. The most valuable is a *History of Switzerland* (Basel, 2 vols. 1734). See Fuch's *Aegid. Tschudi's Leben und Schriften* (2 vols., St Gall, 1805). To the same family belongs JOHANN JAKOB VON T., the eminent traveller and naturalist, born at Glarus, 25th July 1818. After completing his studies at Leyden and Paris, he undertook (1838) a voyage round the world; but circumstances restricted his design to an investigation into the natural history and ethnography of Peru, where he remained for five years. On his return to Europe (1843), he wished to join the Arctic expedition of Sir John Franklin, but was again prevented by circumstances from doing so, and finally settled as an author on his estate near Wiener-Neustadt, in Lower Austria. T.'s principal works are: *Peru: Reiseskizzen aus den Jahren* 1838—1842 (2 vols., St Gall, 1846); *Untersuchungen über die Fauna Peruana* (St Gall, 1844—1847, with 76 plates); the splendid work, *Antiguedades Peruanas* (Vien. 1851), executed in conjunction with Don Mariano Eduardo de Rivera, and which has been translated into English by the Rev. F. L. Hawks (New York, 1854); and *Die Kechuasprache* (2 vols., Vien. 1853), containing a grammar and dictionary of the Peruvian language.

TSETSÉ (*Glossinia morsitans*), a dipterous insect, which is a terrible pest of some parts of South Africa. It is not much larger than the common house-fly, of a brown colour, with four yellow bars across the abdomen. The wings project considerably beyond the abdomen. It is remarkably alert, at least during the heat of the day, and dexterously avoids any attempt to catch it with the hand. 'Its peculiar buzz,' Livingstone says, 'can never be forgotten by the traveller whose means of locomotion are domestic animals.' Its bite is almost certain death to the ox, horse, and dog. Livingstone, in one of his journeys, lost forty-three fine oxen by it. Yet the bite is harmless to man, to the mule, the ass, and apparently to antelopes and the other wild animals of the country. The proboscis is adapted for piercing the skin, and the fly lives by sucking blood. At first, no effect is perceived; but in a few days after an ox has been bitten by the T., the eyes and nose begin to run, 'the coat stares as if the animal were cold,' a swelling appears under the jaw, and sometimes at the navel, emaciation and flaccidity of the muscles ensue, purging, sometimes staggering and madness, and finally death. On dissection, the cellular tissue under the skin is found to be injected with air, as if a quantity of soap-bubbles were scattered over it.—Livingstone's *Travels*.

TSONG-KHA-PA (orthographically, *b*Tsong kha pa*) is the great reformer of Lamaism (q. v.), who, by his co-religionists, was considered to be an incarnation of the Bodhisattwa Amitâbha, or, according to others, of Manjus'rî or Vajrapân'i, and after his death, was canonised by the Lamaist Church. He was born in the middle of the 14th c. after Christ, in the country Amdo, in the place where now the celebrated convent *ss*Ku'bum is situated. According to the legends of Tibet, he was conceived by his mother in a supernatural, immaculate manner: he was born with a white beard, and from the day of his birth expressed himself clearly and fluently, and discoursed profoundly on religious matters. In his third year, he resolved to renounce the world. His mother accordingly cut off his long beautiful hair; but when it fell to the ground, a tree grew up—which is still in a court-yard of the convent of *ss*Ku'bum, and was seen and described by the missionaries Huc and Gabet, in the year 1845. The leaves of this tree are covered with one or more letters of the sacred Tibetan alphabet. He now lived retired from the world, entirely devoting himself to prayer and contemplation. A learned Lama from the West, 'with a long nose and bright eyes,' came to settle about this time in Amdo, and seems to have become his teacher. After his death, T. set out to Tibet, and travelled until he came near Lhassa, where a god bade him halt. Here he studied assiduously the Buddhistic law, and soon became convinced of the necessity of reforming the actual worship and discipline of the Lamaist Church. When his teaching attracted a great number of pupils, and when these, in order to distinguish themselves from the followers of the old system, who wore a red cap, assumed as their mark a yellow cap, the head of the Lamaist Church resolved to stop the innovator in his dangerous course, and accordingly summoned him to his presence. But T. did not deign to obey his command. Thereupon, the great Lama repaired in person to the bold monk; but when he entered the cell of T., his red cap fell off—and when he began to descant on the superiority of the old system, T.—seated and turning the beads of his rosary—without raising his eyes, cried out: 'Miserable! I hear the groans of a creature whom thou murderest!' And, in fact, unmindful of the first commandment of the Buddhist law, the great Lama was busy crushing a louse which he had caught. Confused, he fell at the feet of T.; and from this moment no further resistance could be made to his reforms. Such is the legend; but independently of it, history tells us that the influence which T. exercised on the reform of Lamaism, though not miraculous, was very powerful, such as to reduce the wearers of the red cap to a small minority. His reputation having widely spread, thousands of pupils thronged round him to hear and to adopt his doctrine. In consequence, in 1407 or 1409, he founded the convent *d*Ga' *l*Dan; and when this could no longer contain the number of his adherents, two other convents, which, together, it is said, are now peopled with 30,000 monks of the yellow cap. His works are numerous and voluminous; the most celebrated of them is the *Lam nim ch hen po*, or, 'The great Step-road towards Perfection,' consisting of three parts, namely, 'the road of the little, middle, and great man.' The sect which he founded, and which adopted the yellow cap, is called *d*Ge lugss pa, or the sect of virtue; and the principal reforms which he introduced into the Lama religion as it then existed, were compulsory celibacy for the monks—the Lamas of the old doctrine being conditionally permitted to marry—prohibition of sorcery

* The small letters prefixed to the initials of the Tibetan words in this article are not pronounced

and necromancy—which were extensively practised by the wearers of the red cap—and the institution, at fixed periods, of religious exercises and of common prayers, and, consequently, of regular meetings of the whole community. His greatest achievement, however, was the organisation of the Lamaist hierarchy as it still exists. See LAMAISM. He died in 1419. His body is preserved in the convent *d*Ga' *l*Dan: it is free from decay; and, like the tomb of Mohammed at Medina, suspended in the air without any support. His portrait is seen in all the temples of the yellow religion, often between those of the two Lamaist popes, of whom the *Dalai Lama* is at his right, and the *Pan chhen Rin po chhe* at his left. He is recognisable by two lotus flowers which he holds in his hands, folded for prayer, and one of which usually carries in its calix a candle, while the other supports a book. His canonical name is *b*Lo *b*Sang graggs pa, or 'the Celebrated Sage.'—See for further detail, C. F. Koeppen, *Die Lamaische Hierarche und Kirche* (Berlin, 1859), and the works quoted there.

TU'AM, an inland market-town and episcopal seat, as well as centre of a poor-law union, of Galway, Ireland, is situated on the Harrow, a branch of the Clare, 125 miles west from Dublin, with which it is connected by a branch from the Midland Great Western Railway. The pop. in 1871 was 4938, of whom 4280 were Roman Catholics, and the rest Protestants of the Established Church and of other denominations. It has been an archiepiscopal see since the 12th c., and continues to have this rank in the Roman Catholic Church; but in 1839, the province was united in the Established Church with the archbishopric of Armagh, of which T. is now a suffragan see. The town possesses little trade, except in agricultural produce; but there are some tanneries, a flour-mill, and a brewery. The Roman Catholic church, which is a modern structure, is of great size, and of very striking architecture. Both the Roman Catholic archbishop and the Protestant bishop have residences in T.; and under the direction of the former is the college of St Jarlath, numerously attended, but designed chiefly for clerical students. The municipal affairs are under the direction of commissioners. The schools, which are under the care of the brethren of the Franciscan Order, are numerously attended.

TUARIKS. See BERBERS.

TUBER, in Botany, a subterranean stem, thickened by the approximation of the nodes and swelling of the internodes, with latent buds along its sides ready to produce new plants in the succeeding year. The cellular tissue is unusually developed, and in general a large quantity of amylaceous matter is accumulated, whence the economical value of tubers, as in the potato, the Jerusalem artichoke, and the arrow-root. Tubers are capable of being employed for the propagation of the plant, by division into portions, each containing an *eye* or bud, according to the usual mode of planting potatoes. Like bulbs and corms, they may be regarded as a store laid up for the plant itself, that it may spring with new vigour in a new year. Like them, also, and even in a greater degree, they are in many cases a provision for the use of man. The most valuable tubers are those already named, but many others are used in different parts of the world. See OXALIDEÆ, TROPÆOLUM, &c.

TU'BERCLE is a word that has been employed by pathologists of different epochs in very different senses. The older writers employed the term merely to express an external form; and everything was called a tubercle which manifested itself in the form of a small knot. Without entering into any discussion of the views of Laennec (who asserted that tubercle presented itself in the lungs under two different aspects—namely, as *tubercular infiltration* and *tubercular granulation*, and thus opposed the old knot-theory), of Lebert (who was the first accurately to describe the so-called 'tubercle-corpuscles'), of Reinhardt (who, with many others, holds that tubercle is nothing more than one of the forms presented by inflammatory products when undergoing transformation, and that all tubercular matter is really inspissated pus), or of Rokitansky, Van der Kolk, Williams, Walsh, Paget, and other eminent pathologists, we shall briefly give the theory of tubercle which Virchow adopts in his *Cellular Pathology*, and which is perhaps more generally adopted than any other. Virchow holds that tubercle is a granule or a knot, and that this knot constitutes a new formation, which, from the time of its earliest development, is necessarily of a cellular nature, and like all other new formations, has its origin in connective tissue. When this new formation has reached a certain degree of development, it constitutes a minute knot; and if it is near the surface it forms a little protuberance, its mass consisting of small nucleated cells. The great characteristic of this formation is its extreme richness in nuclei, of which, at a first glance, it seems entirely to consist. But upon isolating the constituents of the mass, either very small cells with a single nucleus are seen, or larger cells with twelve, twenty-four, or even more divided nuclei are observed, these nuclei being always small, and having a homogeneous and somewhat shining appearance. In the accompanying figure (magnified 300 diameters), the whole succession of transitions is seen from the simple connective-tissue corpuscle, the division of the nuclei and cells, up to the production of the tubercle-granule, the cells of which, in the middle, are disintegrating into fatty granular *débris*. In its minute nuclei and very small cells, it contrasts strongly with the large and comparatively gigantic corpuscles of some of the more highly organised forms of cancer. To use the expressive language of Virchow: 'Tubercle is always a pitiful production, from its very outset, miserable.' For an account of the *Cheesy Metamorphosis* which subsequently characterises the tubercle, and which is the regular but not the invariable termination of this formation (since tubercle *may* undergo a complete fatty metamorphosis, and become capable of absorption, or may undergo calcareous degeneration, in which form it remains comparatively inert), we must refer to the above-named pathologist's *Cellular Pathology*, translated by Chance (Lond. 1860), to Rokitansky's *Morbid Anatomy*, vol. i., and to Paget's *Surgical Pathology*.

Tubercle.

Tubercle is usually described as occurring in two principal forms, the first being distinguished as the yellow, and the latter as the gray; the latter is also known from its ordinary size as the miliary

tubercle. The latter is the tubercle to which the above description of Virchow applies, the yellow being the same in a state of fatty degeneration or cheesy metamorphosis. In consumption, we often find large masses of softening tubercular matter in the lungs and elsewhere. These large masses are formed by the aggregation of smaller masses, which have coalesced as the deposit continued to increase. The intervening tissues at length suppurate, and thus soften and break down the tubercular matter, and lead to its expulsion; for a process of ulceration having been established into the surrounding tissues, the softened tubercle is brought up by coughing, and a cavity or *vomica* is formed at the spot previously occupied by the morbid deposit. It is a remarkable fact, and one of the greatest importance in the diagnosis of consumption, that tubercles, when they affect the lungs, are almost invariably deposited in the upper lobes. When it is stated that consumption is only one manifestation of Scrofula (q. v.), and that tubercle is the essential element of scrofula, it will be seen that the importance of this subject cannot be overrated. On this subject, the reader may with advantage consult the late Mr Ancell's elaborate volume *On Tuberculosis;* or a clever essay, with a similar title, recently published by Dr Dobell.

TU'BEROSE (*Polianthes*), a genus of plants of the natural order *Liliaceæ*, having a funnel-shaped perianth, with 6-parted limb, stamens inserted in the tube of the corolla, a superior capsule, and flat seeds. The COMMON T. (*P. tuberosa*) has rounded bulbous roots; a cylindrical, upright, unbranched stem, three or four feet high; both root-leaves and stem-leaves sword-shaped, and very acute; flowers spiked and somewhat aggregated, large, pure white, the tube a little curved. The plant grows well in the south of Europe, but only bears the open air in more northern climates during summer. The roots are a considerable article of export from the south to the north of Europe; the plant being in high esteem for the beauty and fragrance of its flowers, the odour of which is most powerful after sunset, and has been known to cause headache and asphyxia in a room. The fading flowers emit, in certain states of the atmosphere, an electric light and sparks. The flowers yield an essential oil, which is used by perfumers. The native country of the T. is not quite certain. Another species, *P. gracilis*, is found in Brazil, and has been supposed to be the original of the cultivated plant.

TUBE-WELL. See SUPPLEMENT in Vol. X.

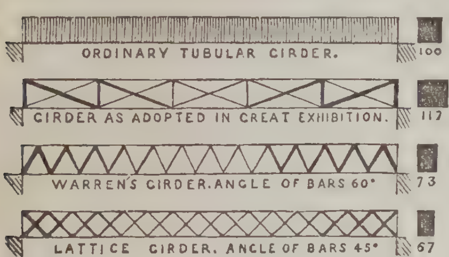
TUBI'COLÆ, an order of *Annelida* (q. v.), having a tubular shelly covering, into which the animal can entirely retreat, but from which, when undisturbed, and disposed to activity, it projects its head and gill-tufts. The genus *Serpula* (q. v.) is a good example.

TUBICO'LIDÆ, or GASTROCHÆ'NIDÆ, a family of lamellibranchiate molluscs, remarkable for the calcareous tube into which the proper shell is cemented. Examples are noticed in the articles ASPERGILLUM, CLAVAGELLA, and GASTROCHÆNA. The *Pholadidæ*, including Pholas (q. v.) and Teredo (q. v.), are included by some in this family. *Teredo* has the characteristic tube, but *Pholas* has not.

TÜ'BINGEN, an important town of Würtemberg, in the Circle of the Black Forest, 20 miles south-south-west of Stuttgart, is situated on the Neckar, at the influx of the Steinlach, in one of the most beautiful and fertile districts of the Oberland. T. is an old place, irregularly built, with steep and narrow streets in the main; but the suburbs, especially round about the new university, are very pleasant. Westward from T. is the Schloss, built by Duke Ulrich in 1535. Book-printing, bookselling, working in copper, weaving, bleaching, trading in field-produce, wine, and fruits, form the principal sources of employment. T. has three Protestant churches and one Catholic church, a Bible Society, a Chamber of Manufactures, and various educational and benevolent institutions. But it owes its celebrity wholly to its university. Founded in 1477 by Eberhard im Bart, afterwards first Duke of Würtemberg, the university of T. soon became a distinguished seat of learning, enjoyed for a time the presence of Reuchlin (q. v.), and Melanchthon (q. v.), and continued to flourish long after the Reformation had firmly established itself. The Thirty Years' War, however, fatally checked its prosperity; and it was not till the early part of the present c. that it began to reacquire a reputation. Under Baur (q. v.), it has recently become celebrated as a school of historico-philosophical theology, known as the 'Tübingen School,' the influence of which on the development of religious thought has been very great, and is likely to prove permanent. The university has 6 faculties, 41 ordinary and 12 extraordinary professors, a library of 150,000 vols. (located in Duke Ulrich's *Schloss*), and was attended (1862—1863) by 678 students, of whom nearly 100 were foreigners. Connected with it are an anatomical and physical institute, a botanical garden, a chemical laboratory, a collection of zoology and comparative anatomy, one of minerals, one of coins and antiquities, fencing, gymnastic, and swimming schools, &c. Pop. of T., in 1880, 11,839.

TU'BULAR BRIDGE. The advantages of the tube for carrying a level roadway across a large span were brought into general notice by Robert Stephenson, engineer of the Chester and Holyhead Railway, in the construction of the bridges to carry that railway across the Menai Strait. It was required by the Admiralty, that these bridges, called the Britannia and Conway, should be constructed, so as not to interfere with the navigation, with clear spans of upwards of 400 feet. The largest arched spans that had been previously constructed did not exceed 240 feet; and suspension-bridges not being suitable for heavy and rapid railway traffic, the engineer was obliged to devise some new form, which should conform to the stipulated conditions. Mr Stephenson having decided upon the tubular form, proceeded, in conjunction with Mr Fairbairn, to make an elaborate series of experiments on tubes, to determine the most suitable arrangement of the wrought iron of which they were to be composed. They found that a rectangular tube, of which the top and bottom were cellular (as in fig. 7, article STRENGTH OF MATERIALS), gave the greatest strength with the least material. The span of the Conway tube was 400 feet; while the tubular part of the Britannia Bridge consisted of two spans of 460 feet, and two of 230 feet each in the clear. The foundation-stones of these bridges were laid in 1846 and 1847 respectively. Since that time, many important bridges have been constructed on this principle. One of the largest and most important is the Victoria Bridge, over the St Lawrence, near Montreal, in Canada. The total length of this bridge is 9144 feet, or nearly 1¾ mile. It is built in 24 spans, of from 242 to 247 feet each, and one of 330 feet. The greatest depth of the river is 22 feet, and the average rate of the current 7 miles per hour. The bottom of the centre tube is 60 feet, and at the abutments the bottom is 36 feet above the water, so that there is a rise of 1 in 130 in the roadway towards the centre of the bridge. An idea of the stupendous nature of this structure may be formed from the facts, that 9000 tons of iron were used in the tubes, and 1½ million of rivets; also that the total surface of iron was 32 acres; and as it received 4 coats of

paint, the total painting was 128 acres. There were 2,713,095 cubic feet of masonry, and 2,280,000 cubic feet of timber in the temporary works, dams, &c.; and upwards of 3000 men were employed. The first stone was laid on July 20, 1854, and the first train passed over on December 17, 1859. The total cost was £1,400,000, or about £57 per lineal foot. Notwithstanding the success of these structures, the tubular form has been to a great extent superseded in recent structures by the lattice or trellis. This has arisen from the great saving in the material of which the sides are composed, effected by the open lattice-work, as compared with the solid plated side of the tube. By the lattice arrangement, the material is more capable of arrangement in the direct line of the strains; and the section of the lattice-bars can be accommodated to the strain, so that there shall be no material which is not carrying its due share of the load. The first large structure of this nature was the Boyne Viaduct, on the Dublin and Belfast Junction Railway. Mr Barton, the designer of this structure, in a notice of this bridge, gives the relative weight in the sides of different forms of girders, neglecting the weights of the top and bottom, which are the same in every case, as follows:



Besides this considerable saving in material, the facilities this form gives for repairs and painting, and the exposure of a smaller surface to the wind, are additional reasons for its preference.

TUBULIBRANCHIA'TA, an order of gasteropodous molluscs, having two branchiæ behind the heart, the whole animal enclosed in a long shelly tube, which is sometimes straight, sometimes twisted in an irregularly spiral manner.

TUCKER, Abraham, an English author whose reputation falls far short of his merits, was born in London, September 2, 1705, studied at Merton College, Oxford, and in 1726 became a member of the Inner Temple. T., who was of good family, inherited a large fortune from his father; and in 1727 purchased Betchworth Castle and estate, near Dorking, in Surrey. During his life, he enjoyed all the ease, comfort, and quiet happiness of an English gentleman of the 18th century. It is but fair to state that his frank, generous, virtuous nature, and his sincere love of intellectual pursuits, prevented him from misusing the advantages of his position. In 1736, he married Dorothy, daughter of Edward Barker, Esq.—afterwards Cursitor Baron of the Exchequer, and Receiver of the Tenths—by whom he had three daughters, the youngest of whom, Dorothy Maria, became, in 1763, the wife of Sir Henry Paulet St John, Bart. T.'s affectionate regard for his family is a beautiful feature of his character. He was, too, all his life, an industrious student, a man of keen observation, of much innocent and cheerful humour, and withal, of methodical business habits. His death occurred November 20, 1774. T.'s great work is entitled *The Light of Nature Pursued*. It was begun in 1756, and formed the chief literary occupation of the rest of his life. It extended to seven volumes, only three of which were published in the author's lifetime, under the pseudonym of Edward Search, Esq. It is not a regular systematic treatise, but consists of a series of disquisitions on metaphysics, theology, morals, &c., all of which exhibit a remarkable originality, simplicity of humour, ingenuity of illustration, and solidity of understanding. Scarcely any English book of the 18th c. is more deserving of study, and scarcely any has been more neglected. A critic in the *Saturday Review* (November 12, 1864) has given an intelligent appreciation of its peculiar merits. The best edition of *The Light of Nature* is that published by the author's grandson, Sir Henry Mildmay, reprinted in 1837. A later edition is that by the Rev. Dr Cairns of Berwick.

TUCU'M and TUCUMA' PALMS. See Astrocaryum.

TUCUMA'N, San Miguel de, a town of La Plata, capital of the province of the same name, about 120 miles north-west of Santiago, is embosomed in splendid plantations of fruit-trees. T. has a cathedral, convents, a Jesuits' college, and many handsome houses. It carries on manufactures of sugar, leather, and brandy, has an active trade in oxen and mules; and the females are noted throughout the Confederation for their skill in making saddle-cloths. Pop. 11,000. Here, in 1816, a congress of deputies from the various Argentine provinces met, and proclaimed their independence of Spain.

TUDE'LA (the *Tutela* of the Romans), a city of Spain, province of Navarra, on the left bank of the Ebro, which is here crossed by a bridge of 17 arches, 46 miles by railway north-west of Saragossa. It is a dull, gloomy-looking place, with narrow streets and lofty houses; but the promenades along the river are very fine, as also are the *plazas*, or public squares. T. is the seat of a bishop, has a Gothic cathedral, a medical college, and manufactures of coarse woollen cloths, soap, earthenware, &c., and carries on an active trade in the products of the district. Pop. 8900.

TUDOR, the surname of a family of Welsh extraction, which occupied the throne of England from 1485 to 1603. In the Welsh language, Tudor is the equivalent of Theodore. Owen Tudor, the first of the race known in history, has had a pedigree assigned him from the ancient Welsh princes, which rests on no very solid evidence. In fact, little is known of his origin, except that his father had to quit Wales on a charge of murder, and was outlawed. He seems himself to have been at one time a brewer at Beaumaris, in Anglesey; and he was afterwards a retainer in the suite of the Bishop of Bangor, and fought at Agincourt. His dancing at some court pageant is said to have first ingratiated him with Catharine of Valois, widow of Henry V., who appointed him to the office of Clerk of the Household, and before long entered either into an illicit connection or a private marriage with him. The indignation of the public at this step obliged the queen to take refuge in a convent at Bermondsey, where she died; and Tudor was sent to Newgate, but succeeded in escaping, and obtaining two audiences of the young king, Henry VI., who afforded him protection, and conferred on him the lieutenancy of Denbigh. Two sons had been born to him by the queen. On the elder, Edmond, the king bestowed the earldom of Richmond; and on the younger, Jasper, the earldom of Pembroke. The Earl of Richmond married Margaret, daughter and heiress of John Beaufort, Earl of Somerset, whose father was an illegitimate son of John of

Gaunt by Katherine Swynford. The sole issue of Richmond and the heiress of Somerset, Henry, Duke of Richmond, invited from abroad to deliver England from Richard III., ascended the throne after Richard's death at Bosworth as Henry VII. The partisans of the House of Lancaster supported him on the extinction of the lawful descendants of John of Gaunt; and by his marriage with Elizabeth, eldest daughter of Edward IV., and representative of the House of York, he was considered to have united the factions of the White and Red Rose. Five sovereigns of the House of T. successively occupied the throne—viz., Henry VII., Henry VIII., Edward VI., Mary, and Elizabeth—for an account of whom see separate articles. From Elizabeth, the last of the line, the crown passed to James VI. of Scotland, of the House of Stuart, in virtue of his descent from Margaret Tudor, daughter of Henry VII., and queen of the Scottish James IV. Strength of will was the prominent characteristic of the sovereigns of the House of T.; their rule, generally prosperous, was far more arbitrary and despotic than that of the Plantagenets. Parliament was in many cases but the exponent of the royal will, and taxes were frequently exacted, and penal statutes dispensed with, by the prerogative alone. The condition of England under the Tudors differed from despotic monarchies chiefly in the important respect that the sovereign had no standing army. The T. monarchs exercised a remarkable influence on ecclesiastical affairs; it was under their rule that the Reformation took place, and the Anglican Church was developed.

TUDOR STYLE, in Architecture, a rather indefinite term applied to the late Perpendicular, and the transition from that to Elizabethan.

TUESDAY, the third day of the week, is so called from *Tiwesdæg*, the day of Tiw or Tiu, the old Saxon name for the god of war. See Tyr. The day bears a corresponding name in the other Germanic dialects.

TUFF, a rock formed from the ash or powder ejected from a volcano, mixed with the lapilli, or small fragments of lava. It may be arranged under the air, and remain quite loose, or be cemented by the percolation of water charged with mineral matter, by pressure or other cause. Sometimes the materials are arranged under water, and then the tuff contains organic remains, like other aqueous rocks.

TUILERIES, Palace and Gardens of the, are situated in the middle of Paris, on the right bank of the Seine, with Rue de Rivoli running along their north side, and Quai des Tuileries to the south. Here, in 1342, a certain Pierre des Essarts possessed a pleasure house, called the *Hôtel des Tuileries*, on account of its being built in a locality outside the city where there were several tile-works (*tuileries*). Francis I. bought this property from the Sieur de Villeroy, as a present to his mother, the Duchess of Angoulême. It was afterwards chosen by Catharine de' Medici as the site of a new palace instead of that of Tournelles, and the building was begun in 1566. Originally, the palace consisted of only the square structure in the middle; but was greatly enlarged by Henry IV., Louis XIII. and XIV., Napoleon I.; and it received still further improvements at the hands of the late emperor, Napoleon III.

Louis XIII. was the first sovereign who resided at the Tuileries. Louis XIV. only stayed there for a short time, and then established himself at St Germain; Louis XV. and XVI. lived at Versailles. In 1793, the National Convention held its sittings in the Tuileries; and when Bonaparte became First Consul, he chose it for his official residence. It was the imperial residence of Napoleon III., but was burned by the Commune in 1871.

TULA. See Toula.

TULA-METAL, a peculiar alloy, made of silver, with small proportions of copper and lead. It is manufactured at the imperial metal-works at Tula, or Toula, in Russia, and is used for making the celebrated Russian snuff-boxes, erroneously said to be made of platinum.

TULIP (*Tulipa*), a genus of plants of the natural order *Liliaceæ*, having an inferior bell-shaped perianth, of six distinct segments, without nectaries; a sessile three-lobed stigma, a three-cornered capsule, and flat seeds. The bulb is fleshy, and covered with a brown skin. About thirty species are known, mostly natives of the warmer parts of Asia. The name T. is supposed to be derived from the Persian name *Thouleban*, which also signifies a turban. The most famous of all Florists' Flowers is the Garden T. (*T. Gesneriana*), which is from 18 inches to 3 feet high, with a smooth stem, bearing one erect, large flower; the leaves ovate-lanceolate, glaucous, and smooth. The T. is a native of the Levant; it was brought from Constantinople to Augsburg by Conrad Gesner, in 1559, and was rapidly diffused throughout all parts of Europe. The varieties in cultivation are innumerable. The tulip mania of the 17th c. in Holland is noticed in the article Florists' Flowers. The T. is still most sedulously cultivated in Holland, especially at Haarlem, from which bulbs are largely exported. It is prized merely for the size and beauty of its flowers; its smell being rather unpleasant. Great attention is paid to the cultivation of tulips, not only in the gardens of the wealthy, but often in those of the humbler inhabitants of small towns and villages, in which beautiful beds of tulips may often be seen. Tulips succeed best in a light, dry, and somewhat sandy soil. Bulbs are planted in the end of October, or beginning of November, and the flowers are produced early in summer. Beds of choice tulips are protected in spring by hoops and mats; and in the flowering season an awning of thin canvas is spread over them, which greatly prolongs the duration of their beauty, as they are soon spoiled by exposure to strong sunshine. Tulips are propagated by offset bulbs, and new varieties are raised from seed.—Another species of T. cultivated in gardens is the Sweet-scented T., or Van Thol T. (*T. suaveolens*), which has a short, hairy stem, and yellow or red flowers, inferior to those of the common Garden T. in beauty, but prized for their fragrance, and for appearing more early in the season. It is often cultivated in pots in windows. It is a native of the south of Europe. The Wild T. (*T. sylvestris*), a native of many parts of Europe and Asia, is admitted into the British flora, but is a very doubtful native of Britain. It is common in the woods and vineyards of Germany and the south of Europe. It has a slender stem, narrow lanceolate leaves, and a somewhat drooping, fragrant, yellow flower. It develops offset bulbs at the end of fibres thrown out from the root, at some distance from the parent plant. Its bulbs are eaten in Siberia, although bitterness and acridity characterise the bulbs of this genus.

TULIP TREE (*Liriodendron tulipiferæ*), a beautiful tree of the natural order *Magnoliaceæ*, a native of the United States of North America, having a stem sometimes 100—140 feet high, and 3 feet thick, with a grayish-brown cracked bark, and many gnarled and easily broken branches. The

leaves are roundish, ovate, and 3-lobed; the middle lobe obliquely truncated. The flowers are solitary at the extremities of the branchlets; they resemble tulips in size and appearance. The bark has a bitter, aromatic taste, and like that of all the *Magnoliaceæ*, contains a bitter principle, called *Liriodendrin*. It has been used as a substitute for Peruvian Bark in

Tulip Tree (*Liriodendron tulipifera*).

intermittent fevers, and is a good tonic. The T. T, is one of the most beautiful ornaments of pleasure-grounds, wherever it grows and flowers well, which, however, in Britain, it does only in the southern parts. It is now plentiful in many parts of the south of Europe. In some parts of the basin of the Mississippi, it forms considerable tracts of the forest. The heart-wood is yellow, the sap-wood white. The timber is easily wrought, takes a good polish, and is much used for many purposes.

TULLAMO'RE, one of the capitals, and now the assize town of King's County, Ireland, also the seat of a poor-law union, is situated on the Grand Canal, 59 miles west-south-west from Dublin, with which it is connected by a branch from the Great Southern and Western Railway. It stands upon what may be called a fertile island of the great Bog of Allen, and has within the last half-century risen into some importance. The population amounted in 1881 to 5098, mostly Roman Catholics. It is a place of considerable business, commanding, from its central position, the inland traffic of a very large and not unfertile district. A large trade in corn and agricultural produce was formerly carried on with Dublin by the canal; but the repeal of the corn-law has of late years turned the agricultural industry into other channels. There is a large distillery, as also extensive breweries and several tanneries; and T. is the centre of a busy cattle-trade. The schools, both conventual and national, are excellent, and numerously attended. Within a few miles is situated the extensive Jesuit college of Tullabeg, which receives above 150 pupils.

TULLE, a town of France, dep. of Corrèze, at the embouchure of the Solane into the Corrèze, It is for the most part badly built, but has some fine promenades, excellent quays and bridges, a Gothic cathedral, an episcopal palace, a theological seminary, a communal college, an industrial college, a public library, and a theatre. One of the suburbs of T., called Souillac, is an imperial military manufactory, and the town is otherwise notable for its manufactures of leather, paper, cards, lace (known as *Point de Tulle*), liqueurs, and ironmongery. Some say that T. owed its origin to a Roman fort called *Tutela;* and in the vicinity are certain undoubted Roman remains; others, however, think it dates from the 4th century A. D. The population now numbers about 15,000.

TULLE, a kind of thin silk lace of a very open pattern and loose structure, usually in narrow widths for dressing ladies' caps, &c.

TUMBLER. See LOCK.

TUMBRIL, in an Army, a covered cart on two wheels, for the carriage of ammunition, tools, &c. belonging to the artillery. The name obtained a melancholy celebrity from being applied to the carts which served to carry the unfortunate victims of the French Revolution to the guillotine.

TU'MOURS do not admit of a satisfactory simple definition, but, in the words of Mr Paget, who has specially investigated this department of surgical pathology, they all belong to the class of over-growths or hypertrophies, and their most constant distinctive characters are—(1) that they are deviations both in respect to size and shape from the normal type of the body in which they are found; (2) that they have an apparently inherent power and method of growth; and (3) that their development and growth are independent of those of the rest of the body, continuing with no evident purpose when the rest of the body is only being maintained in its normal type.

Tumours are usually divided into two chief groups, known as innocent or benign, and malignant tumours. The characters of the latter are sufficiently discussed in the article CANCER, and we shall therefore restrict our remarks to innocent tumours. These may be divided into *cystic tumours*, or cysts, and *solid tumours;* while the latter are subdivided into the *discontinuous* and the *continuous;* the discontinuous being those which are completely invested with a layer of tissue, which at once isolates them and connects them with the surrounding parts, while the continuous ones appear as growths, not in, but of the surrounding parts, and appear as *outgrowths*, as, for example, many polypi, and pendulous or sessile tumours. In accordance with these ideas, Mr Paget classifies innocent tumours as follows: I. CYSTIC TUMOURS: CYSTS; which may be (*A*) *Simple* or *Barren*, or (*B*) *Compound* or *Proliferous*. (*A*) *Simple Cystic Tumours* include the varieties known as (*a*) serous, constituting what are termed hydromata, (*b*) synovial, (*c*) mucous, (*d*) sanguineous, (*e*) oily, (*f*) colloid, (*g*) seminal. (*B*) *Compound* or *Proliferous Tumours*, including (*a*) complex cysts, (*b*) cysts with glandular or other vascular growths, (*c*) cutaneous cysts, (*d*) dentigerous cysts. II. SOLID TUMOURS and OUTGROWTHS, including (*a*) fatty or adipose, (*b*) fibro-cellular, areolar, &c., (*c*) fibrous, fibro-muscular, (*d*) cartilaginous, (*e*) myeloid or marrow-like, (*f*) osseous, (*g*) glandular, and (*h*) vascular.

Of these various species we shall only notice a few of the most important. *Cutaneous cysts* may be congenital or acquired. They may be found under the skin of any part, but Mr Paget regards them as probably a hundred times more common in the scalp than in any other part. Their rate of growth is uncertain. When they grow rapidly, they are apt to ulcerate, and hence are derived most of the so-called 'horns' of the scalp and face.

Cutaneous cysts are usually formed either by the morbid growth of natural ducts or follicles, or by the enormous growth of elementary structures, which increase from the form of cells and nuclei, and become closed sacs with organised walls capable of producing other growths. A hair follicle or a sebaceous gland of its duct become obstructed, is thus often the origin of a cyst. Cutaneous cysts may be treated in various ways. Those in which the skin

over their chief prominence is marked with a small dark point, through which a fine probe may be passed into the cavity, may be gradually emptied by dilating their openings, and pressing out their contents; or they may be extirpated by caustic or the knife.

Fatty tumours are the most frequent of all innocent tumours, and are often described under the name of *lipoma* and *steatoma*. They do not differ materially in structure from the ordinary fat of the adjacent parts, and seldom cause much annoyance, except from their unseemly appearance. No good cause can be assigned for their formation, but they may sometimes be traced to a blow or friction, as of a strap. The age at which they most commonly shew themselves is at about forty. They may occasionally be absorbed by the prolonged internal use of liquor potassæ; but this treatment is almost certain to disturb the general health, and as a general rule, excision is the proper treatment. *Fibro-cellular tumours* are remarkable for the rapidity of their growth (three or four pounds in the year, and in one case recorded by Mr Paget, a pound a month), and the weight which they may attain (sometimes forty pounds or more). The most common seat of these tumours are the uterus, the scrotum, the bones, the subcutaneous tissue, the lobules of the ear, &c. Polypi of the uterus, nose, &c., belong to this class. Except in the case of polypi, excision is the only available remedy; and in some parts of the body this is of course impossible.

We will conclude with a reference to a remarkable class of cases which often sadly puzzle the inexperienced surgeon. They are known as *Phantom Tumours*, and are apparently due to contraction of the muscles. 'The abdominal muscles of hysterical women are most often thus affected; sometimes with intentional fraud. The imitation of a tumour may be so close as to require great tact for its detection, but chloroform, by relaxing the muscles, dissipates the swelling. Occasionally, these apparent tumours move.'—Paget on 'Tumours,' in Holmes's *System of Surgery*, vol. i., an article containing an excellent abstract of the most recent knowledge on the general subject of tumours.

TUMU′LTUOUS assemblages are, in point of law, in the category of riots, and were carried to an enormous height in the reign of Charles I. It was afterwards enacted by a statute of 13 Ch. II. c. 5, that not more than twenty names should be signed to any petition to the Crown or either House of Parliament for any alteration of matters established by law in church or state, unless the contents be previously approved by three justices or a grand jury; and no petition should be delivered by a company of more than ten persons. A later statute of 57 Geo. III. c. 19, made it unlawful to convene a meeting of more than fifty persons, or for more than fifty to meet in any street within a mile of Westminster Hall for the purpose of considering any petition or complaint to either House of Parliament for alteration of matters in church or state on any day when parliament is sitting. But the act does not apply to meetings to elect members of parliament. Other enactments were passed as to assemblies of persons collected under pretext of public grievances, but these were temporary, and have now expired.

TU′MULUS. See SEPULCHRAL MOUND.

TUN, a word which, under various modifications, exists in the Celtic and Teutonic languages, seems connected with the Latin *teneo*, I hold, or the Greek *teino*, I stretch, and signifies primarily a large vessel or cask. In various countries, Britain included, it denotes also a liquid measure of capacity; in old ale and beer measure, the tun was equal to 216 gallons (each gallon = 282 cubic inches), in old wine measure it was equal to 252 gallons (each gallon = 231 cubic inches). The tun and all other liquid measures of higher denomination than the gallon are no longer legal; but the names are, for convenience, still retained. These denominations had their origin in the natural practice of giving names to casks in common use which preserved a uniform size. As a tun of water weighs a little more than 2000 lbs., it is probable that the ton weight (see TON) was taken from the tun measure.

TU′NBRIDGE, a market-town in the county of Kent, stands on the Medway, on ground rising from the banks of that river, 27 miles south-east of London. The castle, which stands on the Medway, near the entrance of the town, dates from the close of the 13th c., has a noble gate-tower of great size, richly ornamented, and is at present occupied as a military training school. The parish church is a large and old, but sadly disfigured building; but the chief establishment of the town is the Grammar-School, of which the revenues are very considerable. Attached to it are 16 exhibitions of £100 a year, tenable at either university, besides 12 lesser exhibitions. The manufacture of toys and turned and inlaid articles of wood (see next article), is a specialty. Pop. (1881) 9340.

TUNBRIDGE-WARE, a pretty kind of manufacture in wood, carried on at Tunbridge Wells. It consists of small articles, such as ladies' work-boxes, ring-boxes, desks, &c., which are covered with a veneer characteristic of this industry; it is formed by building up a geometric pattern with very small strips of wood of a triangular or square shape in transverse sections; these are carefully glued together so as to form a solid mass, from which thin transverse veneers are cut, and are used to cover the articles made. This trade was formerly of much greater importance than at present.

TUNBRIDGE WELLS, a famous English inland watering-place, and after Bath, the oldest in the country, stands on the south border of Kent, 5 miles south of Tunbridge. The town, which is rapidly extending, occupies the head and slopes of one of the valleys of the Weald, and has in general a south-west aspect, commanding very fine views. The three centres of population are Mounts Ephraim, Sion, and Pleasant, separated by a large common and cricket ground. The waters are chalybeate. The Wells, discovered in 1606 by Lord North, are situated at the end of a promenade called the *Pantiles*. In the vicinity are charming rides and walks. The fashionable season is June, July, August, and September. Tunbridge-ware is also largely manufactured here. Pop. (1881) 24,309.

TU′NDRA (in Finnish, *Tuntur*—that is, mossy flat) is the Russian name for the vast plains which border on the Arctic Ocean in Siberia, and also westwards from the Ural along the north of Europe. They are swampy tracts of land, partly covered over with a thick felt of bog-moss, and partly with a dry snow-white covering of reindeer-moss and different kinds of lichens. It is only the reindeer that renders this frightful waste habitable for the wandering hordes of Samoyedes, who hunt the furred animals as well as the swans and wild geese which in summer flock hither in vast numbers. These polar steppes, however, can be trodden only in winter, when the whole region is one sheet of frozen soil and ice. In summer, when the surface thaws, the greater part of the region becomes an inaccessible morass, except a portion along the north coast of Siberia which retains its snow

covering throughout the year.—See Schrenk, *Reise nach dem Nordosten des Europ. Russland durch die Tundren der Samoyeden* 1837 (Dorpat, 1848).

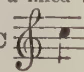
TUNE, a short popular melody; also, that property of musical sounds by which they stand to each other in the relation of Pitch (q. v.).

TU′NGSTEN (symb. W, equiv. 184, sp. gr. 17·6) is a somewhat rare metal, which derives its name from the Swedish words *tung*, heavy, and *sten*, a stone. It is chiefly derived from Wolfram (whence the symbol W), which is a tungstate of iron and manganese, and likewise occurs in Scheelite, which is a tungstate of lime. It is unnecessary to describe the means of separating the metal, which may be finally obtained either as a dark-gray powder or in heavy iron-gray bars, which are very hard, and difficult of fusion. Aqua regia and nitric acid convert it into tungstic acid. When 10 parts of this metal are alloyed with 90 of steel, a mass of extraordinary hardness is obtained.

T. forms three compounds with oxygen—viz., a dioxide (WO_2), or tungstous oxide, which is obtained in the form of a brown powder by heating tungstic acid to low redness in a current of hydrogen; an oxide, W_2O_5, which may be regarded as a compound of the other two; and trioxide, or tungstic oxide, or anhydride (WO_3). Independently of *tungstic anhydride*, there are two modifications represented by the formulæ, M_2WO_4 and $M_2WO_4.7H_2O$, which are known as *tungstic* and *metatungstic acids* respectively. Various tungstates have been formed and examined. Of these, the most singular is tungstate of tungsten (W_2O_5, or WO_2,WO_3), which is of a splendid blue colour; and tungstate of sodium, which answers admirably as a means of preventing muslin, &c., from bursting out in a flame, when brought in contact with fire. It is unnecessary to notice the metatungstates, or the sulphides, chlorides, &c., of tungsten.

TUNGÛS, an ethnographic group of the Turanian family, are at the present time situated to the north and east of the Mongol group, inhabiting the vast plains stretching south from the icy sea of Siberia, between the Yenesei and the Lena, the northern slopes and valleys of the Great Altaï, and the hilly uneven tract between the Upper Amur and the Lena. The chief peoples included under this group are the Niuju, the Däurians, Tshapodshirs, Manchûs (in the south-east), and Lamûts (on the east coast). In the north, they have intermingled with the Samoyedes; in the west, with the Ostiaks, whose territory is on the other side of the Yenesei; and in the south, the Manchûs, though being gradually pushed northward by the Chinese, have for a long time exercised undisputed sway over their supplanters. Divided politically between Russia and China, the southern portion of them are Buddhists, while the tribes further north mostly practise Shamanism (q. v.), a few having, by the strenuous exertions of the Russian government, been induced to profess Christianity. The T. are partly nomad and wandering, and partly agriculturists and settled rearers of cattle. The first of these are commonly classed according to the districts they prefer to dwell in, as T. of the forests, or T. of the steppes: the former being shepherds, hunters, or fishers; and the latter exclusively shepherds. The steppe T., again, are divided according to the animals of draught they employ, into the reindeer-T., the horse-T., and the dog-T. The T. are in general robust and lively, with flat visage and small eyes, the latter characteristics, however, being much less prominent in them than in the Kalmucks. A portion of the Chinese Tungûs constitute the Ssolon nation so celebrated as warriors in Chinese modern history. The Tshapodshirs tattoo their faces.

TUNICA′TA, a class of acephalous molluscs, having the body enclosed not in a shell, but a soft elastic tunic, which is perforated by two apertures, and is composed of a substance resembling Cellulose (q. v.). The T. are extremely numerous, and are found in all seas. The *Ascidiæ* (q. v.) belong to this class, and the *Sulphidæ* (q. v.).

TUNING-FORK, a contrivance for regulating the pitch of the voice or of a musical instrument. It consists of two prongs of steel springing from a handle, and so adjusted as to produce a fixed note when struck. It is usually tuned in C  in Britain, and in A  in Germany. In consequence of the absence of any universally recognised standard, there is even in this country a considerable variety in the pitch of the tuning-fork. Messrs Broadwood employ three forks of different pitch to tune their pianofortes: one corresponding to the Philharmonic standard of 30 years back for instruments used for the accompaniments at ordinary concerts; another somewhat higher for pianofortes meant to take part in orchestral compositions; and a fork of still higher pitch, adopted for the present opera and Philharmonic standard, which is about a semitone higher than the standard of 30 years ago. A fork has lately been invented in Germany capable of adjustment to different standards of pitch, by means of a movable brass slider, fitted with a screw, there being indications on the prongs of the positions of the slider which give the pitch adopted by the principal orchestras in Europe.

TU′NIS, a country of Africa, and one of the Barbary States, is bounded on the N. by the Mediterranean, on the W. by Algeria, on the S. by the Desert, and on the E. by Tripoli and the Mediterranean. Its greatest length from north to south is about 440 miles; its average breadth, 160; area, upwards of 75,000 sq. m.; pop., according to latest authorities, 2,000,000. T. is traversed by branches of the great Atlas range, which, in fact, has its proper termination here. The northern coast is rocky and steep, with numerous bays, of which the largest is the Gulf of Tunis; and two of its promontories, Capes Blanco (*Râs-el-Abid*) and Bon, are the most northern in Africa. The eastern coast, on the other hand, is flat, sandy, and infertile, like that of Tripoli, but has two large gulfs, Hammamet and Cabes (the *Syrtis Minor* of antiquity). The southern part of T. belongs to the desert steppe known as Belud-el-Jerid. There is only one fresh-water lake of any consequence, that of Biserta or Bensart, near the north coast. The brooks and torrents of T. either lose themselves in the sand, or find their way to the sea after a short course. None are navigable. The longest is the Mejerdah (the *Bagradas* of the ancients), which flows in a generally north-eastern direction into the Gulf of Tunis. Other streams are the Ved-el-Milianah and the Ved-el-Kebir. There are several mineral springs in the country. The climate of T. is fine, and the soil exceedingly fertile, so that, in spite of a very poor knowledge of agriculture, wheat, barley, maize, dhurra, pulse, olives, oranges, figs, grapes, pomegranates, almonds, and dates are abundantly produced. The culture of oil is more attended to, and is very lucrative. Great herds of cattle are fed on the plains; the sheep are famous for their wool; and the horses and dromedaries are no less celebrated. The chief mineral products are sea-salt, saltpetre, lead-ore, and quicksilver. In the vicinity of the sea-coasts

considerable manufacturing and trading industry is manifested, more particularly in the cities of Tunis and Susa. Wool, olive-oil, wax, honey, soap, hides, coral, sponges, dates, wheat, and barley are the principal exports. Cloth, leather, silks, muslins, spices, cochineal, and arms are transported by means of caravans to the interior of Africa, whence in exchange are brought for exportation to European and other countries, senna, gums, ostrich-feathers, gold, and ivory.

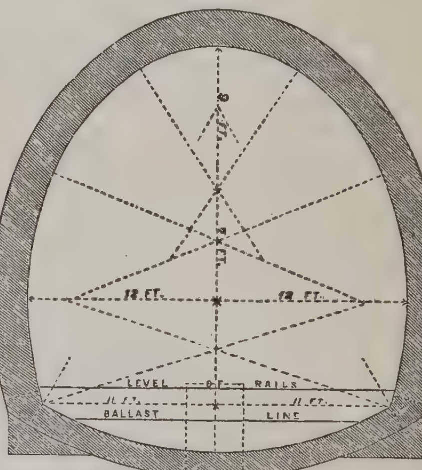
The predominant race is of Arabic descent, but there are many Berbers, especially in the interior. The territory of T. corresponds pretty nearly with that of ancient Carthage; and for a sketch of its pre-Christian history the reader is referred to the articles CARTHAGE, ROME, HANNIBAL, HAMILCAR, SCIPIO, JUGURTHA, &c. Its subsequent fortunes, down to 1575, are interwoven with the general fortunes of Barbary (q. v.); but in that year, Sinan Pasha conquered and incorporated it with the Ottoman Empire, and gave it a new constitution. The government was placed in the hands of a Turkish pasha, a divan or council, composed of the officers of the Turkish garrison, and the commander of the Janizaries. After a few years, however, an insurrection of the soldiery broke out, and a new government was established, the head of which was a 'Dey,' possessing very limited authority; the chief power being at first exercised by the military divan. Gradually, however, an officer with the title of 'Bey,' whose original functions were confined to the collection of tribute and taxes, acquired a supremacy over the other authorities, and finally obtained a kind of sovereignty, which Murad Bey succeeded in making hereditary. The family of Murad Bey ruled in T. for 100 years, and gained considerable renown both by their conquests on the mainland, and their piratical enterprises against Christian powers at sea. Nevertheless, the internal history of T. is, on the whole, little more than a series of palace revolutions, Janizary insurrections, and court intrigues. During the 18th c., it became tributary to Algiers. About the beginning of the 19th c., Hamuda Pasha threw off the Algerian yoke, subdued the Turkish militia, and created a native Tunisian army; in consequence of which T. virtually attained independence. It sends, however, yearly a tribute to Constantinople. The recent rulers, Achmet Bey (1837), Mohammed Bey (1855), and Mohammed Sadyk Bey (1859), have proved liberal, enlightened, and reforming sovereigns. Through their efforts, the slave-trade has been suppressed; numerous obnoxious and oppressive taxes and monopolies repealed, political equality established, and even municipal liberties secured in the capital itself.

TUNIS, capital of the African state of the same name, lies on the west side of a small lake or lagoon, near the south-west extremity of the Lake of Tunis, about 3 miles from the ruins of ancient Carthage. It occupies rising ground, and both the city proper and the suburbs are surrounded by walls. The streets are narrow, unpaved, and dirty, but the bazaars are well furnished, and many of the mosques are really splendid, particularly the mosque of Jussuf, which has beautiful marble pillars. The palace of the bey is probably the finest building in T.; the ceilings glitter with gold, and carmine, and azure. All the principal rooms open into a large courtyard paved with marble, and surrounded by arcades supported on marble columns, while fountains everywhere diffuse a perpetual and delicious coolness. The citadel, begun by Charles V., and finished by Don John of Austria, is interesting from its collection of old arms, and was formerly the great slave prison of Tunis. There are also Roman Catholic and Greek churches, Jews' synagogues, an Italian theatre, and large barracks in Tunis. About a mile and a half west of the city, in a bare, verdureless plain, stands the *Bardo*, or summer residence of the bey, the interior of which is gorgeous. T. has silk and woollen manufactures, as shawls, tapestries, mantles, burnuses, caps, turbans, coloured cloths, also leather, soap, wax, and olive oil, all of which it exports, together with grain, fruits, cattle, fish, ivory, gold-dust, coral, &c. Pop. state at about 125,000.

The lagoon or Lake of Tunis is shallow, and communicates with the *Gulf of Tunis*, an inlet of the Mediterranean, by a narrow strait or channel called the Goletta. The gulf itself is 45 miles broad at the entrance—between Cape Bon and Cape Farina—and extends inland for 30 miles.

TUNKERS. See SUPPLEMENT in Vol. X.

TUNNEL. Tunnels are passages constructed under ground to carry roads, railways, canals, or streams of water. Tunnelling, which has long been in use for roads and aqueducts, has of late received a great development in the construction of railways. At the present time, there are believed to be upwards of 80 miles of railway tunnels in Great Britain in constant use for the passage of trains; and as their cost averages from £45 to £50 per yard, a total of about seven millions sterling has been expended in their construction. The adjoining figure gives the ordinary section of a tunnel to carry a double line of



Transverse Section of a Tunnel on the Leeds and Bradford Railway.

railway. In tunnels of considerable length, as the progress made by working from the two ends would be very slow, it is considered advisable to commence the work from many points of its length; for this purpose, shafts or pits are made at these points down to the level of the tunnel. Of these shafts, some are temporary, and only kept open during the progress of the work; others are permanent, and for the purpose of ventilating the tunnel when in use. These shafts have to be large enough to allow the ascending and descending skips or buckets containing the excavated materials to pass one another. For the temporary shafts, an elliptical shape is found to give the greatest room for this purpose at the least expense. Square shafts are to be avoided, on account of the difficulty of excavating the corners in rocky strata

As the shaft descends, its sides are lined with timber-planks, supported by strong timber-frames, about five feet apart. The permanent shafts, when the material is not of rock sufficiently solid, are lined with brick-work or masonry, built in lengths, as the shaft proceeds downwards. These permanent shafts are generally made circular in section, and it is found better to place them three or four yards from the side of the tunnel, communicating with it by a small passage. This is convenient in the construction, and also is a useful refuge for workmen subsequently during the passage of trains. These shafts are generally made about ten feet diameter. They are sunk a few feet below the floor of the tunnel, to form a pit for the collection of the water from the workings, which is hauled to the top in barrels or buckets. The raising of the excavations and the water, and the lowering of building materials, and of the workmen, is done by a windlass, a horse-gin, or steam-power, according to the extent of the work. On the completion of the shaft, the tunnel is commenced in both directions from its bottom; and in the case of ordinary rock, it is found convenient to commence by making a small adit, or passage, along from shaft to shaft, through the whole length of the tunnel; this is made six or seven feet high, and the top of it placed at the level of the top of the tunnel. When this is completed, the correct centre line is marked out in it throughout the tunnel; the adit is then enlarged to the shape and size of the arch of the tunnel, which is built in, and then the excavation is completed, and side-walls built up to underpin the arch. In cases where the material is soft and full of water, the full section of the tunnel is generally carried forward at once, and in such cases an invert has to be built between the side-walls, to withstand the upward pressure, as the pressure of soft material has the character of a fluid pressure, and presses the tunnel on all sides. The excavation is then done in lengths of about 24 feet, which is firmly secured with poling-boards and larch bars, and securely shored; the centres are then set, and the brick-work built up. The timber bars are generally drawn out when the brick-work is carried up, and the holes they leave rammed tight with clay; but they have sometimes to be built in. When the quantity of water is very great, an adit is driven through the tunnel, at the level of its floor, before the work is begun, to allow the water to run off.

Tunnels are generally made straight, but sometimes they are curved; this is done that they may pass under the lowest part of the hill, in order that the shafts may be as short as possible. They are frequently constructed on steep gradients, but as the trains experience some resistance from the air in passing through them, it is advisable not to make them so steep as the gradients in the open air.

The most remarkable tunnel of the present time is the Mont Cenis* tunnel. This tunnel connects the railways of France and Italy, and is on the direct railway route from Paris to Turin. The length of this tunnel is 7 miles 4¾ furlongs. It is 434 feet higher at Bardonnèche, on the Italian side, than at Modane, on the French side. On this account, it is on a gradient of 1 in 45½ from Modane to the middle, and thence it falls 1 in 2000 to Bardonnèche, this latter fall being sufficient to run off the water. The dimensions at Modane are 25 feet 3½ inches wide at base, 26 feet 2¾ inches at widest part, and 24 feet 7 inches high, the arch being nearly semicircular. At Bardonnèche, it is 11¾ inches higher. It is all lined with stone-masonry, except at the Bardonnèche end, where the arch is of brick.

The work was begun in 1857, and was at first done in the usual way by hand; but in 1861, the perforating machines described below were introduced on the Italian side, and two years later (1863) on the French side. On the 30th June 1863, the tunnel had been driven 2800 yards, and the rate of advancement was 9½ feet per day. The engineers expected, by improvement in the machines, to obtain a more rapid advancement. This, however, they did not succeed in doing to any great extent, for in October 1866, just one-half the distance, or 6680 yards, had been pierced, showing a constant rate of 9½ feet per day. At this rate, it was expected that the tunnel would be completed in 1872; but it was finished in 1871. A premium was to be paid by the French government to the Italian government, who did the work, for each year by which a term of 25 years, counting from 1862, was reduced. The French government was also to pay £1,287,000 for the construction of one-half the tunnel when completed.

This great work, which appeared almost impracticable to ordinary methods of tunnelling by manual labour, was rendered practicable by machinery introduced by the engineers, Messrs Sommeiller, Grandis, and Grattoni. The great difficulty lay in the fact that, from the great height of the mountain, shafts were impracticable, and progress could only be made from each end. The ventilation also presented serious difficulties. M. Sommeiller perfected a small machine, weighing 6 cwt., which bored a hole 1¼ inch diameter and 3 feet deep in twenty minutes; the time taken by two miners working by the ordinary method being two hours. Eleven of these machines were placed on a movable support, and were capable of working at almost any angle. Three or four large holes were bored in the centre of the heading, and round these other holes of the ordinary size, in all 80 holes. The large holes were not fired, but were for the purpose of weakening the rock. The others were then fired in succession and in detachments, beginning with those nearest the centre, and working outwards. The machines were worked by compressed air acting, like high-pressure steam, on a piston in a cylinder; this air was compressed outside the tunnel by water-power acting on the hydraulic-ram principle, and also by an air-pump; it was used at a pressure of five atmospheres above the atmospheric pressure, and was conveyed to the workings by a pipe 7⅞ inches diameter. After it had expended itself in working the borers, it escaped into the tunnel, and so ventilated the workings. The advanced heading was the only place where these machines were used; the enlargement of the tunnel to the full size, the building, &c., were all performed by manual labour. It was expected that upon the completion of the tunnel there would be a constant current of air from the north to the south end, as the latter is the higher end, and in a situation more exposed to the heat of the sun. In view of the great importance of the Mont Cenis route, and the uncertainty of the time of completion of the tunnel, a locomotive railway was constructed over the top of the pass. The rails are laid on the existing road, and ascend the hill in zigzag lines. The steepest gradient is 1 in 12, and on this gradient, and down to 1 in 20, a third rail is laid in the centre of the way, raised about 9 inches above the other rails. The engines are provided with two pairs of horizontal wheels, which being made to press against the centre rail, provide the adhesion necessary for ascending and descending these steep inclines. From experiments

* This is really a misnomer; the tunnel is at a considerable distance from Mont Cenis, and the chief summit under which it passes is the 'Grand Vallon' (11,000 feet high).

it has been satisfactorily proved that passenger trains will make the transit in four hours, thus saving eight hours in the journey from Paris to Turin. Upon the opening of the tunnel for travel, the rails will be taken up and the traffic transferred to the tunnel route.

TUNNY (*Thynnus vulgaris*), a fish of the family *Scomberidæ* (q. v.), found in the Mediterranean and in the Atlantic Ocean, but particularly abundant in the Mediterranean, where the T. fishery is of great importance. It occasionally, but rarely, occurs on the British coasts. The genus *Thynnus* is closely allied to *Scomber* (see MACKEREL), but has the dorsal fins close together, the detached finlets more numerous. The T. is a very large fish, sometimes nine feet in length, and weighing 1000 lbs., or even more. Its form is much thicker than that of the mackerel; its tail so widely forked as to be crescent-shaped. It is very plentiful near Constantinople, where it appears in shoals, sometimes so crowded that it may even be taken with the hand. The chief T. fisheries of the present day, however, are on the coasts of Spain, Italy, and Sardinia. The Phœnicians established a T. fishery at a very early

Tunny (*Thynnus vulgaris*).

period on the coast of Spain, and the T. appears on Phœnician medals of Cadiz and Carteia. Salted T. was much esteemed by the Romans, and was called *Saltamentum Sardicum.* The T. is generally captured by means of nets arranged in a funnel-like form, the fish entering the wide mouth of the funnel, and being gradually driven to the narrow end, where they are killed by lances and harpoons. The line of nets is often more than a quarter of a mile long, and costs about 6000 dollars.—The AMERICAN T. (*Thynnus secundo-dorsalis*) is found on the coasts of New York, and thence northwards to Nova Scotia. It sometimes attains a length of twelve feet. It is pearly black above, silvery on the sides, and white below. Its flesh is much esteemed. It also yields much oil, which is obtained by boiling the head and the belly. Twenty gallons of oil are often obtained from a single fish.

To the same genus with the T. belong the Bonito (q. v.) and the Albacore or Albicore (*T. albacorus*), which inhabits the West Indian seas, and is esteemed for the table. The name Albacore, however, seems to be often given to different species of this family, inhabiting tropical seas, and sometimes to the T. itself.

TUPAIA. See BANXRING

TU'PELO (*Nyssa*), a genus of trees of the natural order *Cornaceæ*, natives of North America, chiefly of the middle and southern parts of the United States; having simple alternate leaves, mostly entire, greenish inconspicuous flowers at the extremity of long stalks, the fruit a drupe. *N. multiflora* attains a height of 60—70 feet. It is often called SOUR GUM TREE. *N. tomentosa*, the LARGE T., is a lofty and beautiful tree, remarkable for the extraordinary enlargement of the base of the trunk, which is sometimes eight or nine feet in diameter, while at no great height the diameter diminishes to fifteen or twenty inches. The fruit resembles a small olive, and is preserved in the same way by the French settlers in America. *N. candicans* or *capitata*, the OGECHEE LIME or SOUR GUM TREE, is a small tree, of which the fruit is very acid, and is used like that of the lime. The wood of all the species is soft, that of the large T. remarkably so.

TUPPER, MARTIN FARQUHAR, D.C.L., F.R.S., a poet rather popular than great, was born on 17th July 1810. His father, Martin Tupper, was a well known London surgeon, of a family originally German, which had long been settled in Guernsey. Martin T. was educated at the Charter-house, and afterwards at Christchurch, Oxford. On leaving college, he entered himself as a student at Lincoln's Inn, and was called to the bar in 1835; but literature had more charms for him than the law, which he never seriously prosecuted. In 1832, he published anonymously a small volume of poems, which attracted little attention. For this lack of success, he was, however, amply repaid on the appearance, in 1839, of his *Proverbial Philosophy.* The popularity of this work in England, and still more in America, has ever since been immense, and almost unprecedented. The critics have indeed been less kind to it than the reading public; and the fame of Mr T. has long been a topic of mirth to the wits of the literary guild; but from the serene height of his fortieth edition an author can perhaps afford to smile at the attacks of the envious generation below. A fair criticism would probably adjudge that, while there is nothing in Mr T.'s *Proverbial Philosophy* to justify its enormous success—so far as mere circulation is success—the book is yet something better than the mere conglomeration of stupid platitudes, which its detractors so confidently proclaim it to be. Besides this work, on which his reputation—such as it may be—rests, Mr T. has published *The Crock of Gold*, a tale; *Geraldine*, a sufficiently ludicrous attempt to complete Coleridge's inimitable fragment *Christabel*; with various other works in prose and verse, which it is quite unnecessary to enumerate, inasmuch as no one of them has succeeded in making the least impression on the public.

TURA'NIAN LANGUAGES. In opposition to *Iran*, the name of their own country, the Persians from the earliest times called the countries lying to the north of it Turân, and this name is still frequently used as synonymous with Turkestan. The term Turanian derived from it has been adopted by philologists, in contrast with Aryan (q. v.), to designate a family of languages comprising 'all languages spoken in Asia and Europe (including Oceania), and not included under the Aryan and Semitic families, with the exception of Chinese and its cognate dialects.' The languages of this family are of the agglutinate order (see PHILOLOGY). Max Müller classes them in two great divisions, the Northern and the Southern. The Northern division falls into five sections—the *Tungusic*, *Mongolic*, *Turkic*, *Finnic*, and *Samoyedic* Of these, the Tungusic dialects, which extend north and west from China, are the lowest in organisation, being, some of them, nearly as destitute of grammatical forms as the Chinese. The Mongolic dialects are superior to the Tungusic, although the different parts of speech are hardly distinguished; both branches, however, are believed to be manifesting symptoms of grammatical development. The Turkic dialects, of which the Osmanli

or Turkish of Constantinople is the most prominent, occupy an immense area, extending from the Lena and the Polar Sea to the Adriatic. They are extremely rich in grammatical forms, especially in the conjugation of the verb. The most important members of the Finnic class are the Finnic of the Baltic coasts (see FINNS), and the Hungarian language, or Magyar (see HUNGARY). These dialects have also a fully developed grammatical structure, and in point of declension are even richer than the Turkic.

The Southern division comprises, among others, the *Tamulic* or Dravidian dialects of Southern India (see TAMIL); the *Gangetic* group, divided into two branches, the Trans-Himalayan (Tibetan, q. v.) and Sub-Himalayan (Bhotanese, &c.); the *Taic*, or the dialects of Siam; and the *Malaic*, or Malay and Polynesian dialects. The Turanian languages do not present the same unmistakable family likeness, the same clear evidences of genealogical relationship, as are presented by the Aryan and Semitic groups. The nature of their structure, and the nomadic character of the peoples speaking them, are sufficient to account for their exceeding diversity, even supposing them to have all sprung from the same original stock. 'The only characteristic Turanian feature which always remains is this: the root is never obscured. Besides this, the determining or modifying syllables are generally placed at the end, and the vowels do not become so absolutely fixed for each syllable as in Sanscrit and Hebrew. On the contrary, there is what is called the Law of Harmony, according to which the vowels of each word may be changed and modulated so as to harmonise with the key-note struck by its chief vowel. The vowels in Turkish, for instance, are divided into two classes, *sharp* and *flat*. If a verb contains a sharp vowel in its radical portion, the vowels of the terminations are all sharp; while the same terminations, if following a root with a flat vowel, modulate their own vowels into the flat key. Thus we have *sev-mek*, to love, but *bak-mak*, to regard, *mek* or *mak* being the termination of the infinitive. Thus, we say, *so-ler*, the houses, but *at-lar*, the horses, *ler* or *lar* being the termination of the plural.'—Max Müller's *Science of Language*, 1st series.

TU'RBARY, in the Law of England, is a right to go upon the soil of another and dig turf, and carry away the same. It is classed under the head of a *Profit à Prendre*, and is generally traced to some ancient custom of a manor, or is proved by prescription, or long use for thirty years and upwards.

TU'RBINE. See WATER-POWER.

TURBI'NIDÆ, a family of gasteropodous molluscs, having a spiral shell, with a narrow entire aperture. The species are numerous; some of them are found on the British coasts. They are numerous and widely distributed. Some are large, others small; some are very beautiful. The beautiful pheasant-shells (*Phasianella*) of the South Seas are referred to this family.

TU'RBOT (*Rhombus maximus*), a fish of the family *Pleuronectidæ*, or Flat-fishes, the most valuable of them all. The genus *Rhombus* has the body rhomboidal; the dorsal fin commencing immediately above the upper lip, and extending almost to the tail-fin; the eyes generally on the left side. The Brill (q. v.) belongs to it as well as the T., and some other less important fishes. The T. attains a large size, sometimes 70—90 lbs. weight. Its form is shorter, broader, and deeper than that of almost any other flat-fish. It is of a brown colour on the upper surface, which is studded with hard roundish tubercles. Like the other flat-fishes, it generally keeps close to the bottom of the sea; and it is found chiefly on banks where there is a considerable depth of water. Some of the banks in the German Ocean abound in T.—as the Dogger Bank —and yield great quantities to the London market. The T., however, is also found, although more sparingly, in estuaries. In former times, it was chiefly caught by long lines; but of late, the greater part of the supply for the London market is obtained by beam-trawling (see TRAWLING). Few kinds of fish are more prized for the table than the turbot.—The AMERICAN or SPOTTED T. (*Rhombus maculatus*) is also highly esteemed for the table. It is common on the coasts of New England and New York. It attains a weight of 20 lbs. The breadth is about one-half of the length. The upper surface is smooth, reddish gray, with large circular or oblong darker blotches, and numerous white spots.

TURDI'DÆ. See MERULIDÆ.

TURENNE, HENRI DE LA TOUR D'AUVERGNE, VICOMTE DE, one of the most eminent of France's military heroes, was the second son of Henri, Duke of Bouillon, and Elizabeth of Nassau, the daughter of William I. of Nassau-Orange. the great assertor of the liberties of the Netherlands, and was born at Sedan, in the dep. of Ardennes, 11th September 1611. Brought up in the Reformed faith, he was sent, on the death of his father in 1623, to Holland, where, under his uncle, the celebrated Maurice (q. v.), he was initiated into the art of war. Returning to France in 1630, he was favourably received by Richelieu, who at once gave him a commission. In 1637, he was attached to the army of Bernard of Weimar, which at that time was engaged in Lorraine; and by bringing about the capture of Landrecies, Maubeuge, and other places, including the key of Western Germany, Brisach, gained such repute, that on his return to Paris (1638), he experienced quite a triumphal reception. The victories of Route and Casale in the Italian campaign of the following year, added to his laurels; and in 1641 he was for the first time intrusted with the supreme command. The rapid and thorough conquest of Roussillon from the Spaniards in 1642, was good proof of his masterly military genius, and was rewarded in 1643 with the baton of a marshal of France, and the chief command on the Rhine, where repeated reverses, a defective commissariat, and want of pay, had completely demoralised the army. But through a liberal expenditure of his own funds, and of loans obtained by him on his own security, the troops were speedily re-equipped; and by a victory over the Bavarians at Rottweil (1644), their *morale* was restored. Condé's arrival transferred him to a subordinate position; and his restoration to supreme command was followed by the commission of a glaring strategic error for which he was severely punished by his able and watchful opponent, Mercy, who completely routed him at Marienthal, 5th May 1645; but on August 3 of the same year, this disgrace was amply avenged by Condé at Nordlingen, where Mercy was slain; and T. gloriously concluded the war on the part of France by the reconquest of the Treves electorate, by the conquest of Bavaria in conjunction with the Swedes, and by a successful campaign in Flanders. In the civil wars of the Fronde (q. v.), which immediately followed, T. joined the party of the *frondeurs*, of whom his elder brother was one of the principal leaders; but after being defeated at Rethel (December 15, 1650), he withdrew to Flanders, returning on Mazarin's retirement. On the minister's return, T. joined his party, while Condé deserted to the *frondeurs*, and the two greatest generals of the period were for the first time pitted against each

other. T. was uniformly victorious over his former chief, though his forces were inferior in number; and ultimately forced him to retire from France: after which he subdued the revolted cities, crossed the northern frontier, and conquered much of the Spanish Netherlands. In 1667, on the outbreak of war between France and Holland, Louis XIV. created T. Marshal-general of France, and would have made him Constable, had he not been a Protestant. Indeed, the unorthodoxy of T. had for some time been a matter of grave concern to the bigoted young monarch, at whose suggestion Bossuet attempted the veteran's conversion by composing his celebrated *Exposition de la Doctrine Chrétienne*, which, backed by the king's repeated solicitations and remonstrances, and doubtless, as Voltaire suggests, by the more efficacious promptings of ambition, had ultimately the desired effect. T.'s campaign in Holland, in which he was nominally under Louis's command, was a most triumphant one; and the Elector of Brandenburg, who had ventured to side with the Dutch, was pursued to Berlin (1672), and forced to beg for peace. The emperor next took up arms on behalf of Holland, whereupon T. was transferred to the Upper Rhine. This, his last campaign, is foully disfigured by the horrible devastation of the Palatinate, executed under express orders, doubtless, but with a willing thoroughness which is utterly unjustifiable. After routing the Germans at Mulhausen and Turckheim, and forcing them across the Rhine, he was at last opposed to a worthy antagonist in Montecuculi (q. v.); but, unfortunately, their famous passage of strategy of nearly half a year's duration was left unfinished, T. being killed while reconnoitring the ground at Salzbach, with a view to a grand engagement. His grateful sovereign, to shew that he made no distinction *entre porter le sceptre, et le bien soutenir*, ordered him to be entombed at Saint Denis, and funeral orations were pronounced for him by Flechier and Mascaron. On the desecration of Saint Denis during the Revolution, T.'s monument suffered with the rest, and was ultimately placed by Napoleon under the dome of the Invalides. T. has left Memoirs of his campaigns from 1643 to 1658, which are of considerable interest to the student of history. Many biographies of this eminent warrior have been written, by Raguenet, Ramsay, Buisson, D'Avrigny, &c.

TURF LAWS. The laws concerning the ancient pastime of horse-racing are subdivided into those affecting races, wagers, and betting-houses, for which last, see BETTING. 1. As to racing, it has sometimes been popularly believed that the public have a right to trespass on lands to attend or to hold races; but no such right exists. Hence the stewards or persons intrusted with the management and possession of the land for the time have a right, which is seldom enforced, to turn off any person they please from the grounds. A sweepstakes is a stake or fund, for which at least three entrances must be made, and the whole stake becomes, under certain regulations, the property of the winner. Many of the great races are not run within a year from the time the horses are entered. The owner of a horse entered can withdraw or 'scratch' him before the race is run. When the race is run, the successful party may sue for the amount of the stakes; and if the race is not run, or cannot be run, each subscriber may sue for recovery of his contribution; but no one can obtain his contribution, or countermand it, till the event has happened, for a sweepstakes is a legal contract to abide the result. If the stakes are contributed for an illegal game, it is otherwise; and before the stakes have been paid away, any contributor may sue for and recover his deposit; but he ought also formally to demand it back. The stewards are the proper parties to decide all disputes about the fairness of a race, and their award is binding: if they cannot agree, then it will fall to be decided by a jury. It is no legal objection to their award, that one of them is interested in the decision, for this is considered partly unavoidable, and within the knowledge of all parties as a probable event. If there are three stewards, the decision of the majority is binding.—2. As to wagers. It was not illegal at common law to enter into a wager, if the subject-matter was not injurious to morality or decency; and hence the bet could be recovered by action, and betting on a race is still legal to any extent. But by the act 8 and 9 Vict. c. 109, s. 15, all wagers were declared void, except as regards subscriptions of money or plate to be awarded to the winner of a lawful game, sport, pastime, or exercise. If one makes a wager on a race, he may retract it any time before the event comes off, and require the money, if deposited, to be repaid; and no wager can be tried in any court of law or equity, so that the winner cannot compel payment. It is merely a debt of honour.

TURGOT, ANNE ROBERT JACQUES, French statesman, born in Paris, May 10, 1727, was descended from one of the oldest families in Normandy. T. was destined for an ecclesiastical career, but adopted by preference the profession of law. In 1761, he was appointed Intendant of Limoges, and administered the affairs of the province for thirteen years. He introduced a more equitable administration of imposts, and succeeded in abolishing the old method of repairing roads and bridges by the compulsory labour of the poor inhabitants of the district, called *corvées*. He also exerted himself in providing for the subsistence of the people and the protection of commerce. He introduced into the Limoges the cultivation of potatoes. A wider field opened before him on the death of Louis XV. The finances were in a terrible state of disorder, the whole social and political system of France needed regeneration and reform; and T. appeared to be the man to meet the crisis. He was first made Minister of Marine, and afterwards Comptroller-general of France, when to fill that post was to be virtually the Prime Minister. In his letter to Louis XVI., he adopted, as the principle of his administration, that there should be 'no bankruptcy, no augmentation of imposts, no loans;' yet he foresaw that the strength of the privileged classes, and the corrupt influence of those who profited by abuses, would be too much for him, and that against such enemies he could hardly hope to retain the confidence of the king. His first task was so far to reduce the expenditure as to leave a surplus of 20 millions of francs a year, to be applied to the liquidation of old debts. He augmented the public revenue without imposing new taxes, and he introduced exactness of payments and fidelity of engagements into all his financial operations. One of his first measures was the carrying-out of free-trade in corn throughout the interior of the kingdom. He constantly occupied himself with the amelioration of the condition of the people. He proposed to enfranchise the rural districts from statute labour, provinces from their barriers, commerce from internal duties, trade from its shackles, and, lastly, to make the nobility and clergy contribute to the taxes in the same proportion as the third estate. This great minister and virtuous citizen, of whom his colleague, Malesherbes, said: 'He has the head of Bacon, and the heart of L'Hopital,' wished, by means of provincial assemblies, to accustom the nation to public life, and prepare it for the restoration of the States-general.

If the nobility and privileged classes had possessed enough of foresight and patriotism to submit to his plans for reforming France, she might have been spared the horrors and excesses of the Revolution. But his projects for the public good were defeated by the confederacy formed against him by nobles, courtiers, farmers of the revenue, and financiers. The king forsook him, although, at the same time, observing that T. and himself were the only persons who desired the welfare of the people. He retired, having held office for only twenty months. It is alleged against his practical talent for statesmanship, that he laboured under a want of address, and that he did not sufficiently dissemble his hatred and contempt for the cowardice and baseness of those who fattened upon the abuses that were eating like an ulcer into the heart of France. After his retirement, he resumed his early worship of the Muses. His Latin inscription for the portrait of Franklin is a line of which any author might be proud: 'Eripuit cœlo fulmen, sceptrumque tyrannis.' He also devoted himself to physics and mathematics. His works are a mine of sound and original thought. His *Mémoire* on the American war expresses views on the nature of colonies which have since been adopted by the best writers. His work on *Usury* contains almost all that is of value in Bentham's *Letters on the Usury Laws.* He held general objections to charitable institutions. He died of gout, March 20, 1781, leaving behind him a memory which France will ever cherish with veneration.

TURIN (*Augusta Taurinorum*, *Bodincomagus*), *Colonia Julia*, *Taurasia*—in Italian, *Torino*), a city of Northern Italy, formerly capital of Piedmont, then of the kingdom of Italy, is situated near the confluence of the Po and the Dora Riparia, 45° 5′ N. lat., 7° 42′ E. long. Its pop. at the beginning of this century was 42,000—in 1863, it was 235,000; after the capital was removed to Florence, it was reduced to 204,800. It began to acquire importance when Amadeus V. declared it the capital of Savoy in 1418, built a castle there, and made it his residence. In 1620, Charles Emanuel I. enlarged the city by royal decree: it was still more enlarged in 1673 and in 1702. At the beginning of this century, the French destroyed and levelled the ramparts of the town, converting them into public promenades. Of late years, the moats and fortifications have been demolished, to make way for new streets towards Porta-Susa. In consequence of these improvements, T. has become one of the handsomest cities in Europe. It is famed for its handsome squares. Some of the finest are—Piazza San Carlo, surrounded by wide porticoes, and adorned by a fine equestrian statue of Emanuel Philibert of Savoy, by Marochetti; Piazza Castello, also surrounded by porticoes, which are prolonged down Via Po to the end of Piazza Vittorio Emanuele, the finest square in Europe for size, regularity of architecture, and beauty of situation; Piazza Carlo Felice, with porticoes and a fine garden; Piazza Carlo Alberto, with an equestrian statue of the king of that name by Marochetti; Piazza d'Armi, a vast open space for military exercises, flanked by the old and new arsenals of the kingdom. Leading out of Piazza Vittorio Emanuele, there is a handsome five-arched bridge across the Po, begun by Napoleon I., with money got by the sale of the jewels and votive offerings of the cathedral, and finished by the kings of Sardinia. Another fine bridge is that across the Dora, of one single arch, nearly straight, the work of the engineer Mosca. Among the numerous churches, the principal are the cathedral of San Giovanni, a Gothic structure, built in the 7th c., and reconstructed in 1498; San Filippo, the handsomest church in T.; La Consolata; La Gran Madre di Dio; and a Waldensian temple. On the summit of a hill near the town is La Superga, a splendid Basilica, raised by Victor Amadeus to fulfil a vow, and now the mausoleum of the House of Savoy. Among the 'palaces,' must be noticed the royal palace, designed by Castellamonte, which is poor in outward appearance; the Carignano Palace, an odd building, by Guarini; the town-hall, designed by Lanfranchi; the university, with 71 professorships and 888 students (1865), a library of 120,000 vols., and 2000 MSS.; the Accademia delle Scienze, with an Egyptian museum, the finest in Europe; the Seminary; the Hospital of San Giovanni. The private palaces are numerous and vast, but in a bad style of architecture. There is the Theatre Royal; the Carignano Theatre, designed by Alfieri; the Vittorio Emanuele, and many other theatres.

The manufactures of T. consist of woollen and silk fabrics, velvet hats, paper, pottery, leather, arms, and liqueurs. The population is sober, industrious, and generally well off.

T. was originally inhabited by the Taurinians, a tribe of Ligurians. It is first mentioned in history in the time of Hannibal, by whom it was taken and sacked, on his descent into Italy after crossing the Alps. T. became a royal colony, 166 B.C., and was called by Augustus, *Augusta Taurinorum.* On the fall of the Empire, it went to the Lombards, and became the capital of one of the 30 Lombard duchies. Charlemagne made it the residence of the Duke of Susa, whose line ruled till 1032, when the House of Savoy succeeded it. It was taken by the French in 1506, and held by them for nearly 60 years. They again took it in 1640; and in 1796, it was dismantled, and united to the French Empire in 1800 with the name of the department of the Po. In 1815, it was restored to the House of Savoy.

TURKESTA'N, 'the country of the Turks,' called also *Jagatai*, and by the Persians *Turan*, is an extensive region of Central Asia, stretching from the Caspian Sea eastward to beyond Lob-nor (long. 110° E.), and from Siberia and Dzungaria southwards to Persia, Afghanistan, and Tibet. Until quite recently it was supposed that the Bolor Tagh (q. v.), a mountain chain of the first magnitude running north and south, divided it into two parts. English explorers entering T. from the south and Russians from the north have shown this idea to be erroneous, but a lofty table-land, the Pamir Steppe, sloping gently towards the east and west, separates the rivers running eastward to the desert of Gobi from those which run to the sea of Aral, and separates T. into an eastern and western portion.

WESTERN TURKESTAN, *Great Bukharia*, or simply *Turkestan* or *Turan*, consists of the great hollow plain of the Caspian and Aral Seas, which occupies its west and centre, and of the hilly and well-watered districts formed by the western ramifications of the Thian-shan Mountains and the Hindu Kush. The plain is composed of deserts of loose shifting sand, interspersed with oases where a subsoil of clay renders the formation of lakelets of rain possible, strips of fertile land along the banks of rivers, and occasional tracts clad with coarse thin grass; the eastern districts abound in valleys of remarkable fertility. The climate varies on the plains from extreme cold to burning heat, and though, in the eastern high lands, the cold is almost as intense in winter, the heat of summer is much less. The rivers of T. are the Sir-Daria (see JAXARTES) and Amu Daria (see OXUS), the Zer-Afshan, which rises on the south of the Asfera tag (a prolongation of the Thian-shan range), and flows westward for 400 miles, terminating in a small salt

lake or marsh near Bokhara; and the Murghab, which rises in the mountains of Ghur, and after a west-north-west course of 450 miles, loses itself in a marsh beyond Merv. The vegetable products of the country are fruits, grain, cotton, flax, hemp, and tobacco. Silk is also produced in considerable amount. Forests can hardly be said to be at all represented in this extensive region. Salt is abundant, large tracts of desert being strongly impregnated and even crusted over with it; and sal ammoniac is common. Agriculture, and the breeding of the domestic animals, are the occupations of the great mass of the population; but manufacturing industry is also considerable. The produce consists of cotton, silk, linen, and woollen goods, shagreen (superior to that manufactured in Europe) and other kinds of leather, paper made of raw silk, carpets, and a few sabres, knives, and rifles.

T. is divided into various states, viz., Khiva (q. v.) on the west; Bokhara (q. v.) in the centre; Khokan (q. v.) in the north-east; Kunduz or Badakshan (q. v.) on the south-east; Russian Turkestan on the north; Eastern Turkestan, recently taken from the Chinese, on the extreme east; and Kafiristan (q. v.), a small outlying state, separated from the others by the mighty range of the Hindu Kush. Russian Turkestan, Khokan, and Bokhara are subject to Russia. Of these, Khokan is the largest, most fertile, and most populous, notwithstanding Bokhara and Khiva have repeatedly proved themselves to be more powerful and warlike. In the north are the steppes of the Kirghis, who in Khiva acknowledge the authority of the Turkish khans; in the south are numerous independent predatory hordes of Turkomans, and several fortified cities of the Turkomans, as Andekhuy (pop. 15,000, mostly Turkomans, with a few Uzbeks and Tajiks), Maymene (pop. of city and ten dependent villages, 100,000, mostly Uzbeks), Khulum, Balkh, Akshi, Siripûl, and Shiborghan, all of which, with the exception of Maymene, are generally subject to one or other of the princes of Afghanistan, and raise a revenue by taxes on passing caravans. The inhabitants of T. are of various races—Uzbeks (q. v.), the dominant race, T komans, Karakalpaks, Kirghis (q. v.), Sarts or Tajiks, Persians, Kiptchaks, and a few Arabs, Hindus, and Jews. Of these, the Sarts or Tajiks, the original inhabitants of the cities, are of ancient Persian stock, and along with the Uzbeks, Hindus, and Jews, form the settled population; the Persians are either slaves, or, being introduced into T. as such, have obtained their freedom, and settled in the country; the other races are mostly nomad and predatory. The prevalent religion is Mohammedanism, and most of the tribes are Sunnites. A few Sheeahs, Sufis, and Buddhists are also found. One remarkable feature of the governments of Central Asia is their extreme jealousy of foreigners, which renders the country almost inaccessible to European travellers; and of the few daring spirits who have ventured into it, the greater number, as Conolly, Stoddart, Moorcroft, Guthrie, and Schlagintweit, never returned.

T. has played an important part in Asiatic history from the very earliest times. The contests between the Iranian and Turanian races occupy a prominent place in Firdusi's sketch of the semi-mythical traditions of Persia; and the earliest light of history shews us Bactriana (Balkh) and Sogdiana (Bokhara) as well cultivated and populous countries, generally attached to the Persian Empire, and colonised by Persians, to whom most of the prominent cities of T. owe their origin. With Persia, T. passed into the hands of the Macedonians, who made Bactria an independent Greek kingdom, while the rest was in possession of the Parthians. Under the Sassanides, the Persian boundary was again advanced to the Jaxartes; but the gradual gathering of Turkish tribes from the north-east on the right bank of that river, led to a constant state of warfare on the frontier, which ultimately resulted in the occupation of *Mawer-ul-neher* ('the country between the rivers'—i. e., the Oxus and Jaxartes) and of Khaurezm (Khiva) by the invaders. In the 8th c. of the Christian era, the Arabs possessed themselves of T., and during the decline of the califate, it became the seat of various minor dynasties, as the Samani (q. v.) in Mawer-ul-neher, and the shahs of Khaurezm; and after a brief union with the Seljuk empire in Persia, was mostly united to Khaurezm, and along with it overrun by the Mongol hordes under Genghis Khan (q. v.), on whose death it became one of the four divisions of his vast empire, and was allotted to his son Jagatai. On the decline of Jagatai's dynasty, Timûr (q. v.) rose to supreme authority in T., and in the course of a 35 years' reign, made it the centre of an immense empire, which stretched from the Hellespont to the frontiers of China, and from Moscow to the Ganges. This period was the golden age of T.; its powerful monarch was never weary of adorning its cities with the spoils of victory; colonies of learned men, skilled artisans, and all whose knowledge or abilities could be of service to his subjects, were either transferred to T. from the countries he had conquered, or induced by the most munificent offers to settle there; till under him and his more immediate successors, Samarkand became a focus of enlightenment and learning. But after the death of Shah Rokh, Timûr's youngest son, the empire was split up into numerous fragments; and after a time a new dynasty snatched Persia from Timûr's family, while the Uzbeks, under Sheibani Khan, drove them (1500) from the country north of the Amu-Daria; one of the expelled princes, Mirza Baber, who had ruled in Ferghana (the south half of Khokan), subsequently founding the 'Great Mogul' empire in Hindustan. The Uzbek empire generally included Badakshan, Herat, and Meshed; but these were lost on its division, in 1658, into various independent khanates. Khiva was conquered by Nadir Shah in 1740, and Bokhara limited to the north bank of the Amu-Daria; but the Kirghis of the Little Horde restored the independence of Khiva, which they ruled till 1792, when the present Uzbek dynasty obtained the throne; and Shah Murad (1806—1822), celebrated under the appellation of *Beggee Jan*, effectually re-established its former extensive sway to the Bokhariot sceptre. Khakan, after emancipating itself from the authority of Sheibani's successors, was incorporated with Bokhara; but afterwards united with the states of Eastern T.; and on their conquest by China, resumed its independence. The recent history of T. presents only a series of wars between Bokhara and Khokan, and Bokhara and Khiva, in which the Bokhariots had generally the advantage, owing to the aid of the Turkomans of the southern desert, whom they subsidise; the raids of the Turkomans along the northern frontier of Persia; the advance of the Afghans from the south-east; and the progress of Russian conquest from the north and west.

To explain the Turkoman raids a few additional words on the geography of T. are necessary. Between the deserts of T. and those of Persia lies a long and fertile tract running from the south-east of the Caspian to Herat, the 'key to India;' over it pass the great routes from Western to Eastern Asia. North of it, chiefly in the deserts, dwell the Turkomans, a population of one million of savage brigands and man-stealers, constantly engaged in marauding expeditions against the Northern Persians. They have desolated the frontier, and the atrocities they commit far exceed anything recorded of the African slave-trade. In 1860, Hanza Mirza, an uncle of the present

shah, marched against them, but was defeated in attempting to capture their intrenchments in a marsh. On that occasion 15,000 Persians and 30 guns were taken by the Turkomans. In 1865, a more successful expedition proceeded against Saraks, and the guns were recovered. Still the northern routes are in the hands of the Turkomans, more especially that leading by the Daman-i-koh Hills; and so late as 1872 reports appeared of Turkoman raids in Northern Persia. The south-eastern part of T. has also been the scene of recent strife. The Afghans have invaded it for the recovery of possessions they claimed north of the Hindu-Kush. In 1850, they took Balkh and Khulm, and in 1859, Kunduz, Badakshan at the same time submitting to pay a large tribute. The English and Russian governments seem now to recognise the claim of the Afghans to fix their frontier at the Oxus.

The Russians bid fair soon to absorb all that remains of independent Turkestan. In 1864, they annexed Khokan, the largest and most fertile of the khanates. A struggle followed with Bokhara. On the 20th of May, 1866, was fought the battle of Irjar, the most important event in the recent history of Turkestan. The emir had to flee for his life, leaving his camp in the hands of the enemy. In 1868, the Russians, 8000 men, again advanced and crossed the river of Samarkand. The troops of the emir, 40,000 men, took to flight when they saw the Russians approach with their dreaded artillery, and on 14th of June a treaty was concluded, by which Bokhara transferred to Russia Samarkand and all the territory north and east of it. Khiva still remained independent in the midst of its deserts. On the shores of the Caspian the Russians had established military posts commanding the eastern routes into Turkestan. From these, and from the north and north-east, an expedition in four divisions set out early in 1873 against Khiva. In June news was received in England of the fall of Khiva, which had taken place after no great resistance. The news was welcomed as that of a triumph of civilisation against barbarism; but it is dreaded that Russia will annex the countries now in the hands of the Turkomans, including the northern route to Herat, and prepare for further conquests, threatening alike the commerce and influence of other nations in the East. See *A Journey to the Source of the Oxus*, by J. Wood, with an essay on the *Valley of the Oxus*, by Col. H. Yule (London, 1872); *History of Bokhara*, by A. Vambery (Lond., 1873); article on *Central Asia*, Quarterly Review, April, 1873; and *Ocean Highways*, April, 1873.

EASTERN TURKESTAN, known also as *Upper Tartary*, *Chinese Turkestan*, *Little Bukharia*, and *Tûrfan*, is bounded on the north by the Thian-shan Mountains, on the west by the Pamir table-land, and on the south by the highlands of Tibet or Cashmere. Towards the east it sinks to the desert plains of the Gobi, round the western bay of which it forms a vast crescent-shaped oasis from 4000 to 5000 feet in elevation, drained by the tributaries of the Tarim. This river flows eastward into the desert, and empties itself in the Lob-nor, after a course of 1500 miles. Eastern T. formed till recently a province of China, and its inaccessible position prevented us from obtaining much information concerning it.

Mr Robert Shaw was the first Englishman who entered the country, and from his enthusiastic account of its capabilities as a field for English commerce, it has recently attracted much attention. It is dependent for its fertility on irrigation. The canals ramify over the whole country, sometimes crossing each other at three levels. The plains are covered with cornfields and orchards. So numerous are the latter that, at the distance of a few hundred yards, the whole country seems covered with a wood. In all directions are villages and towns where weekly markets are held, and there are several cities with upwards of 100,000 inhabitants. The political capital is Kashgar; the commercial capital, Yarkand. In the latter there are 60 colleges, with endowments for the education of students in Mussulman law. There is security for life and property, and commerce is protected and encouraged. There is a great demand for English goods and for the teas produced in India, which, it is believed, can be supplied more cheaply from our own frontier than from that of Russia. Mr Shaw, in a letter which appeared in the *Times* of the 25th of January, 1873, showed that there is no difficulty about a return trade as the gold-fields of Khoten are productive, and the whole country produces silk in abundance.

The inhabitants speak Turkish, but are said to be of Persian descent. Little is known of Eastern T. previous to its conquest by Genghis Khan, but after the decay of his empire into petty states, among which are Kashgar, Yarkand, Aksu, and Khoten, the chiefs of these were constantly quarrelling with each other—a temporary peace being occasionally produced by their subjection to some powerful neighbour—till several of the leaders, with the Yarkand prince at their head, invited the Chinese to take possession of the country, which they did in 1758, and it then became one of the great divisions of the Chinese empire. In 1864, however, a mutiny occurred among the Chinese troops, and advantage was taken of it by the family of the Tooras, dispossessed native chiefs, to stir up a Mohammedan insurrection. In it the lead was taken by Yakoob Beg, a Tajik of Khokan; and when the Chinese were overpowered, he assumed supreme power under the name of Atalik Ghazi. He united the whole country between the mountains and the desert into one state, has shown great anxiety to promote trade with India, and in 1872 despatched a mission to Calcutta, where a return mission, under Mr D. Forsyth, was appointed to leave Simla in July 1873. An envoy was also despatched in 1873 to Constantinople, to the sultan, whom the Atalik recognizes as the representative of the califs and commander of the faithful. See *Journey to High Tartary, Yarkand, and Kashgar*, by R. B. Shaw, 1871; and *Despatches and Memoranda as to Trade of Eastern Turkestan* (*Blue Book*, printed in 1869).

TURKEY, or the OTTOMAN EMPIRE (q. v.), called by the Turks *Osmanli-Vilayeti*, includes large portions of the continents of Europe, Asia, and Africa, and consists of Turkey Proper, which is under the direct rule of the sultan, and of numerous dependent and tributary states, governed by their own princes. Turkey Proper is partly in Europe and partly in Asia, and is divided into a number of provinces or *eyalets*. The following table exhibits these divisions as they existed prior to the Russo-Turkish war of 1877—78, which resulted in extensive changes, for particulars of which see the article OTTOMAN EMPIRE.

Eyalets.	Area in Eng. Sq. Miles.	Pop. as estimated (1867).
IN EUROPE—		
Immediate Possessions:		
Constantinople, } Vilayet of Edirné, }	9,450	1,800,000
Vilayet of Danube,	38,619	3,000,000
Vilayet of Bosna,	22,260	1,100,000
Perzerim, } Eyalet of Rumili, } Eyalet of Tirkhala, }	18,711	1,200,000
Eyalet of Janina,	16,170 }	2,700,000
Eyalet of Selanik,	12,075 }	
Isles of the Mediterranean, } Sissan, }	11,781	500,000
Ghirit,	3,276	210,000
Protectorates:		
Roumania,	46,137	4,424,961
Servia,	16,611	1,306,694
Montenegro,	1,680	100,000
Total in Europe,	196,770	16,341,655

Eyalets.	Area in Eng. Sq. Miles.	Pop. as estimated (1867).
IN ASIA—		
Eyalets of Khodavendighiar, Ismir, Koniah, Angora, Kastamuni, Sivas, Trebizond	205,401	10,907,000
Ismit,	3,633	
Vilayet of Erzerum,	119,553	1,906,000
Eyalets of Kurdistan and Karpout,		
Vilayets of Aled and Souria,		
Lebanon,	144,333	2,750,000
Eyalet of Bagdad,		
Eyalet of Hedjaz,	191,352	900,000
Eyalet of Yemen,		
Total in Asia,	664,272	16,463,000
IN AFRICA—		
Tripoli	340,200	750,000
Misr (Egypt)	651,000	8,000.000
Tunis	45,150	2,000,000
Total in Africa,	1,036,350	10,750,000
SUMMARY.		
Eyalets in Europe,	132,342	10,510,000
Protectorates in Europe,	64,428	5,831,655
Possessions in Asia,	664,272	16,463,000
" " Africa,	1,036,350	10,750,000
Grand Total,	1,897,392	43,554,655

As before intimated, the foregoing statistics must be regarded as only approximately correct, since the area and population of T. are known only by estimates, and not as the result of exact measurement and a general census.

The states dependent upon T. are either subject to hereditary chiefs—as in Egypt, Servia, and Montenegro—to elective rulers, or to viceroys appointed by the sultan; and these chiefs, of whatever sort, must, on their accession, be approved of by the sultan, must acknowledge his suzerainty, and pay tribute; in all other respects, they are on the footing of independent rulers.

Land is held in T. under four different forms of tenure—namely, as Miri, or crown-lands; as 'Vacouf,' or pious foundations; as 'Malikaneh,' or crown-grants; and as 'Mulkh,' or freehold property. Property of the first description is held direct from the crown. On payment of certain fees, the government grants the right to cultivate an unoccupied tract of land, over which, however, the sultan continues to exercise the right of seigniory. The second form of tenure, the object of which is to provide for religion and education by the erection of mosques and schools, is of two kinds: 'Vacouf-el-Zaräi,' which is land or other immovable property originally obtained by grants from the crown, and entailed on the eldest surviving member of the holder's family; and 'Vacouf-el-Karamäin,' property bequeathed for pious purposes by private individuals. Since all 'vacouf' property is exempt from taxation, a great loss is caused to the treasury. The 'malikaneh' was originally granted to the old feudal troops; it is hereditary, and exempt from tithes. The 'mulkh,' or freehold property, which the peasants are allowed to purchase from the government on very moderate terms is the most advantageous to the occupiers, but does not exist to a great extent.

Turkey Proper, as the immediate possessions of the sultan are called, is bounded by the Austrian dominions, Roumania, and the Black Sea on the N.; by Persia, the Persian Gulf, and the Arabian Desert on the E.; and by the Red Sea and its outlet, Egypt, the Mediterranean, Greece, the Adriatic Sea, and the Austrian Empire on the S. and W.

TURKEY IN EUROPE, the smaller of the two divisions of Turkey Proper, is generally hilly and undulating, traversed by a mountain system which has its origin in the Alps, whose eastern extension, the Julian Alps, enters the country at its north-west corner, runs in a south-west direction as the Dinaric Alps, keeping parallel to the coast-line, and after entering Albania (q. v.), where it becomes Mount Pindus, assumes an almost southern direction till it reaches the Greek frontier. This range, which forms the watershed between the Adriatic and Ægean Seas, has its culminating point in Mount Dinara (7458 feet), and sends out numerous offshoots over Montenegro and Albania. Its great eastern offshoot is Mount Hæmus, or the Balkan range, which branches off in the north-east of Albania, and runs almost due east to the Black Sea, where it terminates in a bold promontory; this range, which forms the southern boundary of the Danube basin, sends a branch northwards through the east of Servia; two others, the Despoto Dagh and the Little Balkan, south-eastwards through Rumili; and numerous smaller branches over Macedonia. The great river of Turkey is the Danube (q. v.), which, with its tributary, the Save, forms the northern boundary, and receives in Turkey the Bosna and Drin from Bosnia, the Morava from Servia, and the Isker and Osma from Bulgaria. The Maritza (q. v.), whose basin is formed by the Great Balkan and its two south-eastern branches, and the Strumo and Vardar in Macedonia, are also considerable rivers; but those which are situated to the west of the Dinaric-Pindus range, are, from the proximity of that watershed to the sea-coast, insignificant in size; chief of them are the Narenta, Drin, and Voyutza. The primitive rocks predominate in Macedonia; the secondary group in the western provinces and to the north of the Balkan; and tertiary deposits in the basins of the Save and Maritza, and in Suli.

On the high lands, the cold is excessive in winter, owing to the north-east winds, which blow from the bleak and icy steppes of Southern Russia; and the heat of summer is almost insupportable in the western valleys. Violent climatic change is, on the whole, the rule in European Turkey; but those districts which are sheltered from the cold winds, as the Albanian valleys, enjoy a comparatively equable temperature. The soil is for the most part very fertile; but owing to the positive discouragement of industry by the oppressive system of taxation which was long in force, little progress has been made in the art of agriculture, and the most primitive implements are in common use. The cultivated products are maize in the south; rice, cotton, rye, barley in the centre, and millet in the north; the natural products are the pine, beech, oak, lime, and ash, with the apple, pear, cherry, and apricot in the Danube basin; the palm, maple, almond, sycamore, walnut, chestnut, carob, box, myrtle, laurel, &c., in the provinces south of the Balkan; large forests of fir and pine in the north-west; the olive, orange, citron, vine, peach, plum, and other fruit-trees in Albania; and abundance of roses in the valley of the Maritza. The mineral products are, iron in abundance, argentiferous lead ore, copper, sulphur, salt, alum, and a little gold, but no coal. The wild animals are the wild boar, bear, wolf, wild dog, civet, chamois, wild ox, and those others which are generally distributed in Europe. The lion was formerly an inhabitant of the Thessalian Mountains.

TURKEY IN ASIA.—This portion of the Turkish Empire is more hilly than the other, the two almost parallel ranges, Taurus and Anti-Taurus, which are the basis of its mountain-system, cover almost the whole of the peninsula of Asia Minor or Anatolia (q. v.), with their ramifications and offshoots, forming the surface into elevated plateaux, deep valleys, and enclosed plains. From the Taurus chain, the Lebanon range proceeds southwards parallel to the coast of Syria, and diminishing in elevation in Palestine, terminates on the Red Sea

coast at Sinai. Besides the Euphrates (q. v.), Tigris (q. v.), and Orontes (q. v.), the only important rivers of Turkey in Asia are the Kizil-Ermak, which rises on the borders of Cilicia, and after a devious course across the peninsula, falls into the Black Sea, near Samsoun; the Mæander and Sarabat, which flow to the Ægean; and the Sakaria, which empties itself into the Euxine. On the whole, Turkey in Asia is ill-supplied with water; and though the mountain slopes afford abundance of excellent pasture, the plains, and many of the valleys, especially those of the Euphrates, Tigris, and Jordan, are reduced by the parching droughts of summer to the condition of sandy deserts. In ancient times, these now desert districts were preserved in a state of fertility by artificial irrigation; but during the six centuries of almost constant war which convulsed this once fair region, the canals were neglected, and have, ever since the rise of the Osmanli power, remained in an unserviceable condition. Nevertheless, the fertile portions produce abundance of wheat, barley, rice, maize, tobacco, hemp, flax, and cotton; the cedar, cypress, and evergreen oak flourish on the mountain slopes; the sycamore and mulberry on the lower hills; and the olive, fig, citron, orange, pomegranate, and vine on the low lands. The mineral products are iron, copper, lead, alum, silver, rock-salt, coal (in Syria), and limestone. The fauna includes the lion (east of the Euphrates), the hyena, lynx, panther, leopard, buffalo, wild boar, wild ass, bear, wolf, jackal, jerboa, and many others; and the camel and dromedary increase the ordinary list of domestic animals.

Industry, Manufactures, and Trade.—Notwithstanding the primitive state of agriculture in T., the extreme fertility of the soil, which returns from 25 to 100 fold, makes ample amends for this defect, and supplies materials for the comparatively unimportant manufactures and industries of the country. The products are wax, raisins, dried figs, olive oil, silks, red cloth, dressed goat-skins, excellent morocco, saddlery, swords of superior quality, shawls, carpets, dye-stuffs, embroidery, essential oils, attar of roses, plum-brandy, &c. The commerce of T. is extensive and important, and is rapidly increasing. The average annual value of the imports of Turkey in Europe is estimated at £18,500,000 (about $90,000,000), and of the exports £10,000,000 (about $48,000,000). The exports are the surplus of the above-mentioned natural and manufactured products of the country, also wool, goat's hair, meerschaum clay, honey, sponges, drugs, madder, gall-nuts, various gums and resins, and excellent wines; the imports are manufactured goods of all kinds, glass, pottery, arms, paper, cutlery, steel, amber, &c. The principal commercial ports of the country are Constantinople, Trebizond, and Smyrna. The trade of T. is, however, greatly impeded by the difficulty of land-transit; though in 1874, 1608 kilometres (about 1000 miles) of railway had been completed, viz., a line from Varna to Roustchouk; from Kustundie to Tchernavoda, from Constantinople to Adrianople, from Adrianople to Bellova, from Koulleli to Dedeagahtch, from Salanique to Uskub, from Uskub to Elleshan, from Novi to Banjalouka, lines from Roumelie, two lines from Smyrna, and a line from Ismid to Scutari.

Population.—A more heterogeneous aggregation of races than that which constitutes the population of the Turkish Empire can hardly be conceived. Of Turks, there are the Osmanlis, the ruling race, and the Turkomans; of Sclaves, the various peoples of Bulgaria, Servia, Bosnia, Herzegovina, and Montenegro, and numerous other races. According to estimates, in 1867 there were—in Europe 4,492,000 Turks; Sclavonians, 6,200,000; Roumanians, 4,000,000; Greeks, 1,000,000; Albanians, 1,500,000; Armenians, 400,000; Circassians, 595,000; Koords, 16,000; Gipsies, 214,000, and Jews, 70,000,—a total of 18,482,000; in Asia, Turks, 10,700,000; Armenians, 2,000,000; Druses, 1,000,000; Greeks, 1,000,000; Arabs, 900,000; Circassians, 413,000; Moors, 75,000; Tartars, 85,000; Jews, 80,000; Koords, 20,000, and Syrians, 30,000,—a total of 16,463,000; and in Africa, Arabs, 5,050,000:—forming a grand total of 39,995,000. The Greeks and Armenians are traders; the Turkomans and Koords are herdsmen and nomads; the Sclaves, Roumans, and Albanians are the chief agriculturists in Europe, and the Osmanlis, Armenians, Syrians, and Druses in Asia. Of the whole population, about 24,000,000 are Mohammedans, and 15,000,000 Greek and Armenian Christians.

Administration, Religion, Education.—The government of T. is a pure despotism, the sovereign, who is commonly styled Sultan, having also the titles Padishah, Grand Seignior, Khan, and Hunkiar; but though nominally absolute, his power is much limited by the *sheikh-ul-islam*, the chief of the *Ulemas* (q. v.), who has the power of objecting to any of the sultan's decrees, and frequently possesses more authority over the people than his sovereign. The supreme head of the administration, and the next in rank to the sultan, is the grand vizier (*sadri-azam*), under whom are the members of the cabinet or divan (*menasybi-divaniié*), namely, the presidents of the supreme council of state (*alkiami-adlié*) and of the Tanzimat (q. v.), the *Seraskier* (q. v.), the *capudan pasha*, or high-admiral, and the other heads of departments of the administration. The governors of the *eyalets*, or provinces, are styled *walis;* each eyalet is divided into *sanjaks*, or *livas*, ruled by *kaïmakams;* each liva containing a number of *cazas*, or districts; and each caza a number of *nahiyehs*, composed of villages and hamlets. The provincial governors have no longer the power of life and death; and the introduction of the system of tax-collection in practice in Western Europe, has greatly diminished their power of practising extortion on those under their rule. The variable imposts are, however, farmed, but considerable restrictions are imposed on the farmers to prevent oppression. The established religion is Mohammedanism, but all other sects are recognised and tolerated; and since 1856, a Mussulman has been free to change his religion at pleasure, without becoming liable to capital punishment, as was formerly the case. Education was long neglected, but in 1847 a new system was introduced; and since then, schools for elementary instruction have been established throughout T.; and middle schools for higher education, and colleges for the teaching of medicine, agriculture, naval and military science, &c. Many wealthy Turks, however, send their sons to France or Britain to be educated. The newspapers published in T. are about 20 in number; and are printed in various languages, four being in Turkish, two in Greek, and two in French.

Revenue, Army and Navy.—The estimated revenue and expenditure for the year 1874—1875 were respectively £19,646,336 (about $95,481,000), and £20,117,664 (about $97,371,847); the items being:

REVENUE.

Direct Taxes—	
Capitation Tax (*verghi*),	£2,607,768
Land Taxes, License, &c.,	600.000
Military Tribute,	666,708
Indirect Taxes—	
Tithes of Harvest, &c.,	5,600,000
Quarterly Tithes,	1,400,000
Excise on Sheep and Hogs,	1,765,908
Silk,	43,276
Customs,	1,660,000
Leased Lands,	600,000
Tobacco,	1,200,000
Stamps, and other Income, &c	944,000
Salaries, Trusts, Mines, &c.,	1,423,540
Minister of Marine and Commerce and Police,	114,952
Telegraph and Post-office, &c.,	366,00[illegible]

Revenue from Egypt,	600.000
" " Roumania,	32.000
" " Servia, Samos, &c.,	22.176
Total,	£19,646,336
Expenditure.	
Public Debt,	£7,550,072
Dotations,	1,592,000
Restitutions,	104.268
Minister of Interior,	2,274,916
Minister of Justice,	370.008
Minister of Foreign Affairs,	150.000
Minister of Finances,	1,279.452
Minister of War,	3,322.328
Artillery	720,000
Minister of Marine,	800,000
Minister of Commerce and Sanitary Service,	70,952
Minister of Public Instruction,	100,000
Minister of Public Works,	1,783,668
Total,	£20,117,664

The Osmanlis are exempted from the capitation tax. The public debt in 1874 was 4,335,237,191 fr. (about £180,634,880), floating debt 334,665,441 fr.

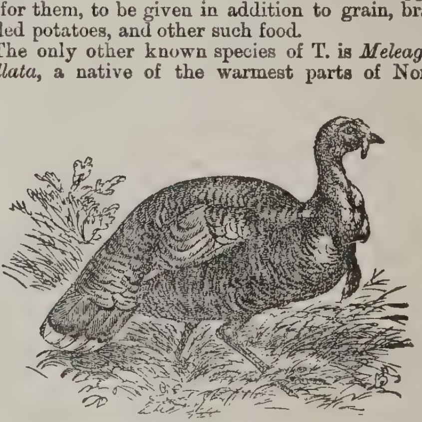
The regular army (*nizam*) was formerly divided into six army corps, and numbered, in all, 110,496 men; with detached divisions, garrisons, &c., of 30,000, of whom 21,200 were effective. In June, 1869, a decree was promulgated for the organization of a permanent army, of which the active part comprised 150,000, with a reserve of 60,000 men, a second reserve of 192,000, and garrison troops numbering 30,000; a total of 702,000 men. The term of service was made 4 years, instead of 5, as formerly. The fleet in 1870 consisted of 13 iron-clads, of 216 guns; 27 screw steamers, of 645 guns; 9 corvettes; 13 advice-boats, of 820 guns; 12 gunboats, of 28 guns, and 35 transports, of 52 guns; total of 109 steamers, of 1761 guns, and 53 sailing vessels. The merchant marine amounted in 1873 to 224 sailing vessels, of 34,711 tons, and 9 steamers, of 3049 tons. The vessels that entered the port of Constantinople in 1868 numbered 22,141, of 5,037,448 tons, and the clearances were 22,542, of 5,064,571 tons. In 1873 the number had increased to 43,582 vessels, of 4,878,500 tons. The length of the telegraph lines in 1870 was 25,487 kilometres.

The history of T. is given under OTTOMAN EMPIRE.

TURKEY (*Meleagris*), a genus of gallinaceous birds of the family *Pavonidæ*, or, according to some ornithologists, of a distinct family, *Meleagridæ*, both, however, being included by others in *Phasianidæ*. The head is bare, the neck wattled, and the bill of the male surmounted with a conical fleshy caruncle, sometimes erected, sometimes elongated and pendulous. A curious tuft of long hair springs from the base of the neck of the male, and hangs down on the breast. The bill is rather short, strong, and curved; the tail is broad and rounded, capable of being erected and spread out, as the male delights to do when he struts about in pride, with wings rubbing on the ground, uttering his loud peculiar *gobble*. The COMMON T. (*M. gallo-pavo*), the largest of gallinaceous birds, well known as an inmate of our poultry-yards, is a native of North America. It appears to have been introduced into Europe in the beginning of the 16th c., and is naturalised in some places; as it may be said to have been in the royal park of Richmond, near London, in the first half of the 18th c., when that park contained about two thousand turkeys; but in consequence of the frequent fights between poachers and keepers, it was thought proper to destroy them. Fewer attempts have been made than might have been expected to introduce the T. in parks and woods in Britain, where it might probably be expected to succeed as well as the pheasant. In a domesticated state, the T. varies much in plumage; in its wild state, this is not the case. The plumage of the wild T. is also richer, and its power of wing greater; but the wings even of the wild bird are short, scarcely extending beyond the base of the tail. The darkest-coloured of domesticated turkeys most nearly resemble the wild T. in plumage. In its native woods, it seems to attain even a larger size than in the poultry-yard. Turkeys were once plentiful in the forests of the Atlantic states of North America, and as far north as Lower Canada, but have disappeared as cultivation has advanced, and have become rare even in the eastern parts of the Valley of the Mississippi, where their numbers were once very great. The T. is found as far south as the Isthmus of Darien, but does not occur to the west of the Rocky Mountains. It inhabits the woods of the larger islands of the West Indies. In warm climates, it is said to produce two or three broods a year; but in colder countries it produces only one. The males associate in flocks of from ten to one hundred, and seek their food during great part of the year apart from the females, which go about singly with their young, or associate in flocks, avoiding the old males, which are apt to attack and destroy the young. At the pairing-time, desperate combats take place among the males. Wild turkeys roost on trees. They feed on all kinds of grain, seeds, fruits, grass, insects, and even on young frogs and lizards. They make their nests on the ground, merely gathering together a few dry leaves, and often in a thicket. The eggs are usually from nine to fifteen in number, sometimes twenty. They spread themselves in summer over the higher grounds; but in winter, congregate in the rich low valleys. The sexes mingle in winter, and form larger flocks than in summer.

On account of its size, and the excellence of its flesh and eggs, the T. is one of the most valued kinds of poultry. The management of it differs little from that of the common fowl. The young are tender for the first few weeks, and require care, particularly to keep them from getting wet by running among wet grass, or the like; but afterwards they are sufficiently hardy. Nettles are excellent food for turkeys, and are often chopped up for them, to be given in addition to grain, bran, boiled potatoes, and other such food.

The only other known species of T. is *Meleagris ocellata*, a native of the warmest parts of North



American Wild Turkey (*Meleagris ocellata*).

America. It is not quite so large as the Common T., and has a smaller tail. The neck is less wattled, but the head has a number of fleshy tubercles. The plumage is beautiful, rivalling that of the peacock in metallic brilliancy: blue, green, bronze, red, and golden hues being intimately and finely mingled, and forming *eyes* on the tail; whence the specific name.

TURKEY BUZZARD. See VULTURE.

TURKEY-RED. This celebrated colour—the most durable, and perhaps one of the most beautiful which has yet been produced on cotton—is dyed by a process supposed to have been practised in India from immemorial time. It passed from thence through other parts of Asia to the countries of the Levant, and was introduced into France about the middle of last century. The first successful attempt to introduce it into Great Britain was made in Glasgow in 1783, by a Rouen dyer named Papillon, in conjunction with Mr George Macintosh, the father of the inventor of waterproof cloth. They established the celebrated Turkey-red business now carried on by Messrs Henry Monteith & Co. By an agreement with the Trustees for Manufactures in Scotland, Papillon allowed them to make his process public in 1803; and since then, Turkey-red dyeing has been extensively carried on in Glasgow and its neighbourhood, and also in Lancashire.

There is a mode of dyeing cotton red with madder practised by calico-printers—the cloth being previously bleached with chloride of lime—where the whole process only occupies a day or two. But in the case of Turkey-red, which is also a madder-dye, the operations are long and tedious, and the bleaching with chloride of lime especially objectionable. The following is an outline of the steps in the Turkey-red process, as usually conducted: 1. Unbleached calico is thoroughly washed at a dash-wheel or other washing-machine, and then boiled for some time in a solution of carbonate of soda. 2. The cloth is soaked in a bath containing a soapy emulsion of olive oil, sheep's dung, carbonate of sodium and water; and allowed to remain for a week or more impregnated with the solution, after which it is aired in the field, and dried in stoves. This operation is repeated at least three times. 3. The next stage, sometimes called 'liquoring,' consists in passing the cloth through an emulsion of olive oil and carbonate of sodium, but without sheep's dung; after which it is aired in the field, and dried in stoves, as in the last operation. The 'liquoring' is repeated at least four times. 4. The cloth now requires to be soaked in a weak alkaline lye of pearl-ash and soda, in order to remove any excess of oil. 5. The cloth is warmed in a bath containing a mixture of powdered oak-galls and sumach, or either of these substances alone, the operation being sometimes called 'galling,' and sometimes 'sumaching.' 6. The cloth is next steeped for twelve hours in a solution of alum, partially neutralised by carbonate of sodium, but sometimes acetate of aluminium is used instead of alum. Without this treatment, the dye could not be fixed upon the cotton. See DYEING. 7. When thoroughly washed, the cloth is ready to receive the red dye, which is produced by immersing it in a decoction of madder, to which some chalk and bullock's blood are sometimes added. It is put into the dye-beck when cold, and kept in it for two hours after it has been raised to the boiling-point. 8. It is next boiled in a weak solution of soap and soda, which removes a brown colouring matter present in the madder-dye, but more fugitive than the red portion. 9. Finally, the dyed cloth is cleared or brightened by boiling it in a solution of chloride of tin, and then washing and drying it. A more recent plan is to employ chloride of lime for the clearing.

The theory of Turkey-red dyeing is not well understood, which so far accounts for the fact, that it has been found impossible materially to shorten the process. The three most essential operations are the oiling, or rather the impregnation with an oleaginous soap, the mordanting with alumina, and the dyeing with madder; but it is found, that if any of the numerous dippings in the oily emulsions are left out, the colour is inferior in proportion to the number of omissions. This is the least understood part of the process, and is no doubt the cause of the rich appearance of the dye, which approaches some of the fine reds produced on wool.

Besides being largely used in its plain state, Turkey-red cloth is extensively employed for handkerchiefs with white patterns produced upon them by discharging the colour (see BANDANA); and of late years, articles of various kinds, with patterns in several colours, have been produced by ordinary calico-printing machines, where, by proper arrangements, the different colours are obtained on parts where the red colour is discharged by chloride of lime.

TURKEY-STONE. See HONES.

TURKISH LANGUAGE AND LITERATURE. The Turkish is one of the Turanian (q. v.) idioms, and is chiefly divided into Eastern and Western Turkish. The former is mainly represented by the Uigur (Jagatai), an idiom but recently recognised not only to belong to the Turkic stock, but to be its most ancient representative. Its forms are fuller and more pure, albeit, to a certain extent, harder and rougher. Its alphabet is formed from the Zabian, out of which have sprung also the Mongol and Mantshu. Besides this, the Kiptchak, spoken in Kasan and Astrakhan, forms a principal branch of the Eastern Turkish, for which, however, but little has hitherto been done from a philological point of view.

Of infinitely higher importance, however, is the Western Turkish, or language of the Osmanlis, which, through the conquests of that race, has spread far and wide over the whole of Western Asia, the Levant, and parts of Europe. The Osman or Western Turkish (emphatically Turkish) is more melodious and soft than the former, and so much mixed with foreign elements, chiefly Arabic and Persian, that, were it not for its grammar, which is purely Tatarian, it could hardly be called an original language, but rather a conglomeration of the three respective idioms. Besides, it has also received a large increase of words from other Asiatic and European languages, e. g., the Chinese, Greek, and Italian. It is one of the most widely spoken idioms; not only Western Asia, but even the east of Europe, use this tongue to a great extent for commercial and political transactions. The characters in which it is now written are no longer the original Uigur letters, but the Arabic, the 28 characters of which have been increased by the four additional Persian characters —produced by further diacritical points, and a new one of their own, amounting in all to 33, which are written from right to left, as is the case in all (save one) Semitic languages. But this alphabet is not well suited to a language composed, like this, of elements belonging to the three great families of speech, viz., Semitic, Indo-European, and Turanic. Neither the vowels nor the consonants are adequately represented in all cases. Occasionally, however, it is also written in Armenian characters, which renders its sounds much more faithfully. There is no definite article or gender. The plural is indicated by a final *lar* or *ler*, and the cases are formed by the addition of *ung*, *eh*, *i*, *den*, and *le* for gen., dat., accus., abl., and instrumental respectively; which are, in plural, affixed to the *ler* or *lar*. The adjective has no flexion, but is placed unchanged after the noun. Diminutives are formed, somewhat like in Italian, by suffixes. The comparative and superlative are formed by circumlocution. The personal pronouns are without gender, and their declension is like that of the nouns. The possessive pronouns are made by suffixes. The Turkish verb is of a very

complex nature. There are seven *genera* (Active, Passive, Negative, Impossible, Causal, Reciprocal, Reflexive), all of which are formed by certain monosyllables affixed or prefixed. The root of the verb is the second person singular imperative, to which the infinitive affix *mak* or *mek* is joined. The moods and tenses are formed chiefly by the addition of the respective forms of the auxiliary verb *olmak*, to be. Apart from this, there are special particles to express the optative, conjunctive, &c. Conjunctions are either formed by gerundives or possessive forms, or they are borrowed from Persian and Arabic. Adverbs are formed by certain suffixes. The Turkish construction is most peculiar: the genitive always precedes the nominative, and the verb always stands at the end. All this gives the Turkish style a peculiarly artificial and inverted appearance, and often a sentence cannot be in the least comprehended until it is quite finished. Oriental flourishes, and allegorical figures of speech, with which Turkish is very lavish, do not tend to facilitate the study of the language.

The original literature of Turkey is to be found in the scanty remains of the Uigur period. That remote eastern branch of the Turkish family had, after their emigration from their homes, south of the Lake Baikal, to the Tangnu Tagh, played a foremost part in the contests and migrations of Central Asia, until they disappeared in the Mongol Empire about 1200 A.D. They were acquainted with Chinese literature, and had adopted the Buddhist doctrines to a certain extent, and their scanty literary relics bear traces of these influences. When, however, the Turks, in the 11th c., began their conquest of the countries of Mohammedan Asia, they learned to appreciate the literature of Persia, then beginning to grow up in its full glory; and ever since, Turkish literature and Turkish language have retained a strong Persian impression. Two branches of Turkish literature are usually distinguished—first, the Eastern or Jagataian, which chiefly flourished between Timur's and Baber's time (1400—1530). Mir Ali Shir, the vizier of Sultan Hussein, is the most renowned poet of this period. He also collected the most ancient Jagatai poems. Sultan Baber, also belonging to this epoch, wrote Memoirs of his life and time (translated into English), which are of considerable importance. The other or Turkish literature, principally so called, is exceedingly rich, but hardly deserving the name of an original literature, it being, for the greatest part, a mere imitation of Persian and Arabic models. Of early writers, deserve special mention Sheikhi, a romantic poet and physician, and Soleyman Tchelebi. In the 16th c., the most flourishing period of Turkey, we find Meshihi, the poet; Kemal Pasha Zadeh, the historian and jurist. In history, we have, besides annalists like Saad-ed-Din, historians like Mohammed Effendi. Of the same epoch is Lamii, who excelled in many branches of literature, besides being an accomplished translator of Persian poets. Fasli (d. 1563) and Baki, the chief of Turkish poets (d. 1600), conclude this period, which is followed by another of great activity, but of inferior rank. It boasts of Nebi, the poet; Neti, the satirist; but above all, Hadji Khalifah (q. v.), the eminent historian, geographer, and encyclopædist. Raghib Pasha stands out in the 18th c., together with Said Rufet Effendi, and a number of smaller writers. Little is to be told of the present stage of Turkish literature; but there is a great activity now visible in the province of educational works, and the reproduction of ancient writings; a feature which augurs well for the future. Redhouse's (Par. 1846) and Kasem-Beg's (Kasan, 1845; Ger. by Zenker, 1847) are the best known English-Turkish grammars; and Kieffer and Bianchi's (*Dictionnaire Turc-Française*, 2 vols., Par. 1835), as well as Redhouse's and Zenker's, among the best dictionaries of the Turkish language.

TURKMANSHAI, a village of Azerbijan, 65 miles east-south-east from Tabriz, is the place where, on February 22, 1828, was concluded the treaty between Persia and Russia, by which the former resigned to the latter the provinces of Erivan and Nakchevan.

TURKS, the name of a numerous, important, and widely-spread family of the human race, members of which are to be found as well on the banks of the Lena in Siberia, as on those of the Danube and the shores of the Adriatic in Europe. The T. belong to the second of Blumenbach's five great divisions of mankind—viz., *Mongolians;* and to the first, or *Mongolidæ*, in Dr Latham's three-fold classification. In this latter classification, the T. form a branch of the Turanian stock of Altaic Mongolidæ. Their geographical distribution, according to Dr Latham, is as follows: '1. As a continuous population. East and west; from the neighbourhood of the Lake Baikal, 110° E. long., to the eastern boundaries of the Greek and Slavonic countries of Europe, about 21° E. long. North and south; from the northern frontiers of Tibet and Persia, about 34° N. lat., to the country north of Tobolsk, about 59° N. lat. 2. As an isolated population. Along the lower course of the Lena, and the shores of the White Sea, chiefly within the Arctic Circle. 3. As portions of a mixed population in China, Tibet, Mongolia, Persia, Armenia, the Caucasian countries, Syria, Egypt, Barbary, Greece, Albania, and the Slavonic portion of Turkey in Europe.' The names Tourkoi, Turkai, and Turcæ occur in some ancient authors as applied to a Scythian people dwelling in Asiatic Sarmatia, and it is very likely that the Scythians of antiquity were allied in blood with the numerous existing Turkish tribes, if not absolutely their ancestors. The original seat of the T. was probably upon the northern slopes of the Altai range, from which, while a portion emigrated into Independent Turkestan, others, going south-south-east, established themselves upon the confines of the Chinese Empire. MM. Abel-Rémusat, Klaproth, Ritter, and other high authorities, concur in tracing all the now existing Turkish tribes to the Hiong-nu, a powerful nation who, prior to the Christian era, threatened to overrun and subjugate China, and who then occupied the whole of the vast region now called Mongolia, from the north of China to Mount Altai. Dr Prichard coincides in this opinion. The Hiong-nu (or *Vile Slaves*, so called by the Chinese), indeed, for some time succeeded in establishing a kind of rule in China, and even intermarried with the imperial family; but about the commencement of the Christian era, their power in China began to wane, and before the end of the 2d c. they were driven back as far as Independent Turkestan. 'After the fall of the empire of Hiong-nu,' says Prichard, the T. 'are known in Chinese history by the name of Thu-k'iû, or Turks, and Whey-ou-eul, by Europeans written Huy-hurs, and more correctly, Uigours. The Uigours, or Eastern Turks, whose history has been elucidated by Abel-Rémusat, are the link of connection between these more remote nations and the Seljuki and Osmanli Turks, who are known to European historians.'

After the fall of the Hiong-nu empire in China, the tribes who composed its strength separated, some maintaining themselves in their acquired settlements, and even conquering portions of China; but by far the greater number spread westward over Western Mongolia, East and West Turkestan,

and Southern Siberia, and gradually lost their power and unity as a nation. Out of this débris of a fallen people arose, in the 5th c., the great empire (the empire of Kiptchak) of the Thu-k'iü, which contested the supremacy of Central Asia with the Chinese on the east, and the Sassanidæ (q. v.) on the west, ultimately falling in 744 before the Hoei-he, a confederation of Turkish tribes which had hitherto been subject to it. The Hoei-he, attacked in the west by the Hakas (the ancestors of the present Kirghis), yielded to their assailants in 848, but retained their power east of the Bolor-tagh, and for 150 years longer ruled supreme from that range to the Hoang-ho. During the eight centuries succeeding their expulsion from China, a regular though slow progress westward had been maintained by some of the Turkish tribes, a portion of whom appear (5th c. A. D.) in Southern Russia, and on the northern frontier of the Byzantine Empire, driving before them the kindred race of the Avars. They were found in Syria and Mesopotamia in the 7th c., and about the same time wandered into Northern and Eastern Khorassan. But the seat of power of the Turkish race still was in Central Asia, whence in the 10th c. the Seljuks (q. v.) emerged, conquering Persia, Syria, and Asia Minor, and establishing an empire which reached from Constantinople to the borders of Mongolia. The subdivision of the Seljuk empire in South-western Asia led to its gradual absorption by the Khaurezmians in the north, and the Kurds in the west, till the irresistible tide of Mongol invasion under Genghis Khan (q. v.), rolling over Central and Western Asia, and the east of Europe, completely overwhelmed Turkish dominancy. The great empire of Timur (q. v.) was Turk, with a strong infusion of the Mongol element, the residue of Genghis's irruption; and its destroyers, the Uzbeks (q. v.), and the various other tribes—Khirghis, Kiptchaks, Turkomans, &c.—which now possess its extensive domains, are also of Turkish race. The Osmanli-Turks are descended from a portion of the Turkish tribe of the Kayi, which fled from its settlements in Khorassan before the Mongols, and took refuge with the Seljuks of Iconium. See OTTOMAN EMPIRE, SELJUKS, &c.

The following is the enumeration of the principal Turkish tribes given by Dr Latham: '1. *Uigurs.*—On the Mongol frontier. Belonging to China. The Uigurs were the first Turks that used an alphabet. Little known. 2. *Turks of the Sandy Desert.*—Conterminous with Mongolia and Tibet. 3. *Turks of Khoten, Kashgar, and Yarkend.* 4. *Kirghis.*—Independent Tartary. The Kirghis (q. v.) form a portion of the population of the highest table-land in Asia—perhaps in the world—Pamir and the source of the Oxus. 5. *Uzbeks* (q. v.).—The Turks of Bokhara. 6. *Turkomans.*—The Persian frontier of Independent Tartary from Balkh to the Caspian. Pastoral robbers. 7. *Ottoman or Osmanli.*—The Turks of the Turkish Empire. 8. *Nogays.*—The Turks of the parts between the Black Sea and the Caspian, north of Caucasus. 9. *Turks of the Russian Empire.*—Bashkirs, Teptyars, Baraba, &c. With all these, although the language is Turk, there is good reason to believe that the original substratum is Finn. With the Bashkirs, this is generally considered to be the case. 10. *The isolated Yakuts of the Lena.*'

In physical appearance, all these tribes, with the exception of the Ottoman T., partake more or less of the Mongolian type. They have in general a broad, flat face, with prominent cheek-bones, the head from side to side nearly equal to its length from the forehead to the occiput, the nose flat, the eyes small, the colour of the skin yellowish, straight hair little or no beard, and stature undersized. It is among the nomad and agricultural T. that these characteristics are most prevalent, while among the more civilised they almost entirely disappear. Dr Prichard quotes Lieutenant Wood's account of the Kirghis as a good average description of the primitive Turkish tribes. 'In stature,' he says, 'the Kirghis are under the middle height; of a *kyl* numbering seven men, the tallest was 5 feet 5½ inches in height. Their countenance is disagreeable; the upper part of the nose sinks into the face, leaving the space between their deeply-seated and elongated eyes without the usual dividing ridge; the brow immediately above the eye is protuberant, but starts back more abruptly than in Europeans; their cheeks, large and bloated, look as if pieces of flesh had been daubed upon them; a slender beard covers their chin; and in those individuals who have more luxuriant hair, the beard has a natural curl. Their persons are not muscular. Their complexions are darkened by exposure to all weathers rather than by the sun. The women are rather good-looking, and of delicate form, like the Hazaras, and make good wives.' The T. of the Turkish Empire, especially those of the upper classes, differ considerably from the type here described. The Ottoman T., in fact, both in feature, height, and general physical structure, bear a strong resemblance to other European nations. This is accounted for chiefly by the custom now prevalent among them for ages of intermarrying with Circassian females.

The various Turkish tribes speak very nearly the same language; 'so much so, that the Yakut of the Icy Sea is said to be intelligible to the Turks of Central Asia, and even of Constantinople.' In religion, the T. are for the most part Mohammedans; but the Yakuts are Shamanists; the T. bordering on the Chinese Empire are Buddhists; and those of Siberia, Christians of the Russo-Greek Church.

TU'RMERIC (*Curcúma longa;* see CURCUMA), a plant of the natural order *Scitamineæ*, a native of the East Indies, much cultivated both in India and in Cochin-China. The leaves are lanceolate, sheathing each other at the base, about a foot long; they spring from the crown of the root, and from their centre rises a short leafy spike, with small cream-coloured flowers. The root is divided into several fleshy fingers, oblong, and as thick as a man's thumb, sometimes crooked when young, and the root then abounds in a kind of arrow-root; but in a more advanced stage, it contains in large quantity a peculiar, resinous, yellow substance, which is used as a dye-stuff, and for other purposes, and is called *Turmeric.* It appears in commerce in the form of dried roots, or as a powder. It depends for its value chiefly on a resinous principle called *Curcumin*, which is scarcely soluble in water, but easily soluble in alcohol and ether. The yellow colour obtained from T. is not very durable, although it is employed as a dye both for silk and wool. Chemists make much use of T. as a test for alkalies, which change its yellow colour to reddish brown, as do also their carbonates and phosphates, some of the alkaloids, and boracic acid. T. test-paper is made by immersing unsized paper in tincture of turmeric. It is much employed in the East in medicine, as a gentle laxative, diuretic, and stimulant. It is also much used as a condiment with many kinds of food, and is the principal ingredient in *Curry-powder.* For its cultivation, T. requires a rich friable soil, and a situation not liable to be flooded. It is propagated by cuttings of the root, which are planted at distances of eighteen inches or two feet. It is planted in April or May, and the crop is gathered in December. This kind of T. is sometimes distinguished by the name of LONG T.; and the name of

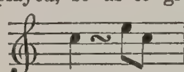
ROUND T. is given to *Kæmpferia pandureta*, a plant of the same order, also a native of the East Indies, the roots of which are shorter and rounder, but otherwise of very similar quality. They are not nearly so much an article of commerce as the other kind, but are particularly valued for the preparation of an artificial gold varnish, as they yield a better colour than the long or true Turmeric. The Arabic name of T. is *Kurkum*, whence *Curcuma*.

TURN, in Music, an embellishment formed by the adjoining notes above and below combined with the principal note, and indicated by the sign ~. Thus

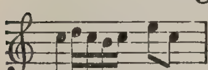
is played thus:

or

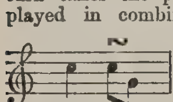
Should another than the principal note follow the turn, the principal note is added before the next note is played, so as to give the turn four notes; thus:



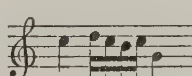
is played



In either of these cases, the turn must be played during the time of the principal note. But when the sign ~ is placed above or below the principal note, the first note of the turn takes the place of the principal, which is played in combination with the others; thus



is played



TURNAU (Boh. *Turnóv*), a walled town of Bohemia, circle of Jung-Bunzlau, on the east bank of the Iser, 50 miles north-east of Prague. It has a church, built in 1825, which is reckoned one of the most beautiful in Bohemia. T. has manufactures of cotton, woollens, and more particularly artificial gems, which are exported in great quantities to the United States. Pop. 4700. Here was fought (July 1866) a battle between the Prussians and Austrians, in which the former were victorious.

TURNER, JOSEPH MALLARD WILLIAM, the greatest of British landscape-painters, was born at 26 Maiden Lane, Covent Garden, London, in 1775. The precise day of his birth is unknown; but an approximation to it is furnished by his baptism, which is registered in the parish church as of date 14th May of that year. He was the son of a barber, and received an exceedingly defective education. His turn for art shewed itself very early, and drew attention to the boy. To a Dr Monro, in particular, who gave him access to his excellent collection of water-colour drawings, and otherwise kindly furtherance, he used afterwards to express his obligations. In 1789, he became a student at the Royal Academy, where, doubtless, he learned something; but throughout he seems to have been indebted less to any formal teaching than to the tentative efforts of his own singularly original genius. In 1787, when only twelve years old, he exhibited two drawings at the Royal Academy. Again, in 1790, he exhibited; and thence onwards till his death, with intermission of only one or two years, his pictures were regularly to be found on the walls. His success is sufficiently shewn in the fact, that so early as 1799 he was elected an Associate of the Royal Academy, and only three years afterwards, attained the full dignity of Academician. The honour was worthily bestowed on one whose claim was already admitted as the first landscape-painter of his time; but his election in 1807 to the post of Professor of Perspective could scarcely be considered so judicious. A man so abnormally illiterate that his simplest note included a crop of solecisms, was not likely to succeed as a lecturer; and as a lecturer he failed utterly. The knowledge which he abundantly possessed, he could not in the least communicate; and after a very few years, he ceased to make the attempt. In the exercise of his art, T. travelled much; he was frequently in Scotland, France, Switzerland, and the Rhine countries; and in 1819, 1829, and 1840, he paid visits to Italy. His industry was almost as unexampled as his genius. To the exhibitions of the Royal Academy, he contributed in all 259 pictures; but among these, many of his finest works were not included; and in another branch of art, the amount of his achievement was extraordinary. In 1808, he commenced the publication of his famous *Liber Studiorum*, a series of engravings from original designs, which ranks as one of his most important undertakings; to this is to be added his *Scenery of the Southern Coast*, *England and Wales*, *Rivers of England*, *Rivers of France*, &c.; and besides, his services were continually in request as an illustrator. The illustrated edition of Rogers's *Poems* is his most celebrated work in this kind, and is quite unique in magnificence. At his death, which took place 19th December 1851, at Chelsea, where his few last years were passed in a small house by the river-side, it was found that he had bequeathed to the nation the noble collection of his works, which now occupies a room in the National Gallery, and remains a permanent monument of the power and splendour of his genius, if also of its occasional eccentricity and extravagance. The large fortune, amounting to something like £200,000, which he had amassed by his industry and thrift combined, he left to found an asylum for decayed artists; but owing to some technical defect in his will, this purpose could not be carried out.

Of the genius of T., and the various phases through which it was developed till it sunk in the decay and deliration obvious in the work of his few last years, we cannot here attempt to treat. In the eloquent pages of Mr Ruskin's *Modern Painters*, the subject will be found thoroughly discussed. Some years since, a *Life of Turner*, in two volumes, was published by Mr Walter Thornbury. The picture it presents is a somewhat dark and painful one. This creator of the beautiful on canvas was in his character and way of life by no means so surprising a revelation of it. He was coarse, sensual, sordid, avaricious: of his inordinate passion for money, many odd anecdotes are extant; but it is only fair to say, that by the few friends who knew him intimately, he was held to be essentially a man of kindly and generous nature. He lies buried in the crypt of St Paul's, beside Sir Joshua Reynolds.

TURNER, SHARON, the Anglo-Saxon historian, was born in London, September 24, 1768, articled to an attorney at the age of fifteen, and succeeded his master in the business before the period of his clerkship had expired. He continued, however, to gratify his literary tastes; and after years of hard reading and patient collection of materials, published, 1799—1805, a *History of the Anglo-Saxons*, in 3 vols., a work, with all its imperfections, that has given its author a permanent place in English literature. Other writings of T.'s are: *The History of England from the Norman Conquest to* 1509 (1814); *History of Henry VIII.* (1826); and *Reigns*

of *Edward VI., Mary, and Elizabeth* (1829); all of which were subsequently republished together under the title of *History of England from the Earliest Period to the Death of Elizabeth; Sacred History of the World as displayed in the Creation and Subsequent Events to the Deluge* (1832, *et seq.*); a volume of essays and poems, &c. T. died February 13, 1847.

TURNHOUT, a well-built town of Belgium, province of Antwerp, 34 miles east-north-east of the city of Antwerp, in the district known as the Campine (see BELGIUM), and the terminus of a branch-line of the Brussels and Antwerp Railway. The inhabitants manufacture ticking, and linen and lace goods, cutlery, paper, oil, &c. Pop. nearly 14,000. T. is historically noteworthy as the scene of two battles, the first won 22d January 1597, by the Netherlanders, under Maurice, Prince of Orange, over the Spaniards; and the second, 27th October 1789, by the patriots under Van der Mersch, over the Austrians.

TURNING, the art of shaping wood, metal, ivory, or other hard substances into forms having a curved (generally circular or oval) transverse section; and also of engraving figures composed of curved lines upon a smooth surface, by means of a machine called a *turning-lathe*. This art is of great importance and extensive application in mechanics, the most delicate articles of luxury and ornament, equally with the most ponderous machinery, being produced by it. The art of turning dates from a very early period, and Theodorus of Samos (about 560 B.C.) is named by Pliny as its inventor; but long before this period, the *potter's wheel* (see POTTERY), the earliest and simplest form of turning-machine, was in general use, as is evidenced by numerous references in Holy Writ. The immense variety of work performed by turning-machines necessitates great variations in their construction; but their mode of operation is always the same, and consists in fixing the work in position by two pivots or otherwise, causing it to revolve freely round an axis of revolution, of which the two pivots are the poles, and holding a chisel or other cutting-tool so as to meet it during its revolution, taking care that the cutting-tool be held firmly and steadily, and moved about to different parts of the work till the required shape be obtained. Lathes are divided, with respect to the mode of setting them in motion, into *pole*-lathes, *foot*-lathes, *hand-wheel* lathes, and *power*-lathes; with respect to the species of work they have to perform, into *centre*-lathes, which form the outside surface, and *spindle*, *mandrel*, or *chuck* lathes, which perform hollow or inside work, though this distinction is for the most part useless, as all lathes of good construction are now fitted for both kinds of work. *Bed*-lathes are those used by turners in wood, and *bar*-lathes for the best sort of metal-work; and the small metal centre-lathe employed by watch-makers is known as a *turn-bench.*

The primitive and most simple form of lathe for wood-cutting is the pole-lathe. It consists of two planks or beams placed horizontally side by side with a narrow space between them, which, being firmly supported at a convenient height, constitute the *bed*; of two uprights or *puppets* rising from the bed, one of them stationary at the left end, and the other sliding along over the slit between the beams, and capable of being fastened at any required point by a projecting tenon and wedge beneath; of a *treadle* below and parallel to the bed; and of an elastic *pole* or *lath* (whence some derive the name lathe) fixed to the ceiling above. This form of lathe is well adapted for turning long thin cylinders of wood, the piece to be turned being held fast at each end by the conical iron or steel point projecting from the inner face of each puppet. Motion is communicated to the work by a cord which is fastened to the lath overhead, wound twice or thrice round the work, and then attached to the treadle below. When the workman presses his foot on the treadle, the work commences to revolve rapidly, unwinding the cord towards the treadle, and winding it up on the side next the pole, causing the latter to bend considerably. During this period, the workman has been holding his cutting-instrument to the work; but after the treadle has been quite pressed down, he removes his foot, and the reaction of the bent pole causes the work to revolve in an opposite direction, till the pole has straightened itself; and during this latter revolution, no cutting is done. When the whole piece is to be turned, the cord must be moved from an unfinished to a finished part of the work. For the pole, an elastic steel bow and string are substituted when the work is light or fine, the cord being attached to the middle of the string, and the bow fastened to the ceiling by its centre. The advantage of the pole-lathe is, that it never acquires an impetus in the direction of the cutting motion, for whenever the pressure on the treadle is removed, the reaction of the pole takes effect; but the great waste of time during the straightening of the pole and rising of the treadle, has caused the abandonment of this machine for the foot-lathe. The foot-lathe, the most common and generally useful form of lathe, differs from the former in having a *head-stock* or *fast-head* in place of the left-hand stationary puppet. This head-stock, H H (fig. 1), consists of

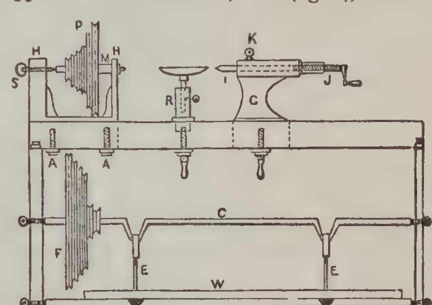


Fig. 1.

two supports or puppets firmly connected at their base, and fastened at right angles to the bed by means of the screws A, A; the outer puppet is pierced for the screw S; and the inner is supplied with a steel collar, within which the mandrel, M, which carries the speed-pulleys, P, turns. The left end of the mandrel is concave, so as to allow the steel point of the screw, S, to fit closely. R is a *rest*, which slides along the slit between the two beams of the bed, and may be clamped at any point, and elevated or depressed as is found necessary. The rest is used by the workman for leaning his cutting tool upon, in order to afford it greater steadiness. G is the right-hand puppet *front-head*, or *tail-stock*, movable along the slit in the bed, and capable of being fastened like the rest; its point, I, can be advanced or retired as required by means of the screw, J. C is the spindle, which, being connected with the treadle, W, by means of the rods or chains, E, E, turns the fly or foot wheel, F, and by means of an endless band connecting the latter with the speed-pulleys, communicates motion to the mandrel. The pulleys on the spindle and mandrel are of different

sizes, and so arranged, that when the endless band is placed on the left-hand pulleys, an extremely rapid motion is communicated to the mandrel, the motion being reduced more and more as the band is transferred more to the right, till, at the extreme right, the rotatory motion is much slower than that of the spindle. When the foot-lathe is required for centre-work, the inner end of the mandrel is furnished with a point similar to I; but when hollow or inside work is to be done, it must be armed with a screw, as in the figure. In this latter case, certain contrivances, known as *chucks*, for holding the work, are screwed on to the end of the mandrel. Some of these most commonly used are the *screw-chuck*, which shews on its right side a flat circular surface, from the centre of which projects a large, coarse, conical screw for holding firmly any large piece of wooden work; the *hollow chuck*, a strong circular cup with perpendicular sides, into which one end of the work is firmly fastened by a mallet, or, if too small, by four screws working inwards through its sides; the *drill-chuck*, of a cylindrical form similar to the last, but with a square cavity for holding drills, the instrument, and not the work, being made to rotate in this instance; and the *concentric chuck*, a most ingenious piece of mechanism—a flat plate with two slits almost to the centre, and in line of a diameter, within which slits works a spindle, with screw-ends carrying two steel studs, whose heads project through the slits above the surface on the right side; these heads carry two curved pieces, which serve as clamps to hold the work; and as the spindle-screws are of the same fineness, and with right and left threads, the revolution of the spindle either removes both further from the centre, or brings both nearer to it; hence, when the studs are once set at equal distances from the centre, they always remain so, and the work may be removed and replaced without danger of destroying the adjustment. All these chucks are of metal, and are mostly employed for heavy work; turners of wood or ivory preferring wood-chucks, which can be altered as required, and secured by an iron ring round the outside, to prevent splitting. The cutting-tools employed are very various: gouges are used to rough out the work—if soft wood—after which chisels with a straight oblique edge are employed: the instruments for harder materials, such as ivory or bone, are smaller than the former, and have their sharp edges 'better backed;' for inside-work, drills are first employed to make an opening, and then cutting-tools of various shapes are employed, according to the form which is wished to be given to

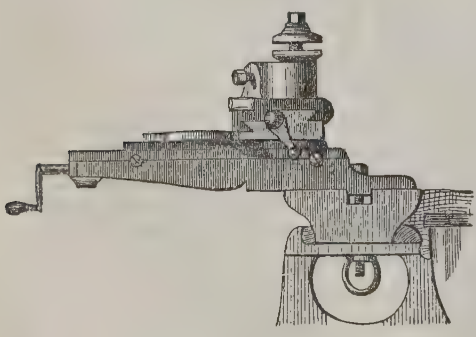


Fig. 2.—Slide-rest.

the interior surface. To avoid the imperfections in the workmanship arising from unsteadiness of hand in the workman, the *slide-rest* (fig. 2) is employed. This valuable addition is furnished with two motions, one towards the work, and the other along, parallel, or at any inclination to it, according as cylindrical or conical figures are required; there is a socket for the chisel, which is firmly held in its place by a screw; and after the slide-rest has been adjusted, the operator has only to move the rest forwards or sideways, as may be required, the motions being effected by two screws and winches.

The *hand-wheel* lathe is similar to the former, but so much larger as to require two workmen, one of whom is employed in setting the instrument in motion by turning a wheel, which corresponds to the wheel F in fig. 1. The *power*-lathe is similarly set in motion by horse, water, or steam power, and is employed for heavy metal-work, as piston-rods, iron columns of various kinds, wheels, artillery, &c. This machine differs from the foot-lathe chiefly in the substitution of rack-work, and wheels and pinions, for the endless band, and for manual labour, in the various adjustments of the machine, such as in moving forward the tail-stock, &c.; and in the mandrel being supported by both puppets of the head-stock. In wood-turning, the wood is first prepared by a hatchet and rasp, must be lightly though firmly pressed against by the cutting-tool; while metal-work must be cleaned from the sand of the mould or scales of the forge, and in turning, requires less care. Soft woods must be made to revolve with great rapidity; very hard woods and brass require much less velocity; wrought iron and copper, still less; steel, a further diminution of speed; and cast iron, the least velocity of all. After the work has been duly shaped, it requires to be polished; and this is effected while it is still in the lathe and rotating, by applying shark's skin to wood, pumice-stone and chalk to ivory and horn, and emery, tripoli, or putty powder to metals.

Hitherto, we have supposed that the axis of revolution of the work is fixed, and consequently that all work has been turned so as to present a transverse circular section; but many other forms of section may be easily obtained. The general mode of obtaining these non-circular figures is by screwing on to the mandrel an apparatus, by means of which the work can be thrown out of the centre of rotation at regular intervals; but as each different class of form requires a separate kind of apparatus, it is impossible here to describe the operations in detail. One species, however, known as *rose-engine turning*, and employed for producing involved curvilineal figures, such as appear on bank-notes and on ornamented gold, silver, or gilt work, is so peculiar and ingenious, as to call for more special notice. In this species, the standards which support the mandrel are no longer fixed at right angles to the bed, but are capable of oscillating backwards or forwards in a plane parallel to the plane of rotation of the mandrel, and are so acted on by a spring, that when pushed to one side they are at once restored to their former position on the pressure being withdrawn. Suppose, then, a metal wheel with its rim waved or indented, fastened concentrically on the mandrel, and the mandrel, pushed aside by a fixed steel point or roller, applied to the rim of the wheel; the reaction of the spring against the pressure of the roller will keep the latter in close contact with the waved rim throughout, and will produce a definite oscillatory movement of the mandrel, of the chuck, and the work fastened on it, and consequently—the cutting or graving tool being firmly held by the slide-rest—definite deviations from a circle in the lines marked on the face of the work. The wave-rimmed wheel, called a *rosette*, may be replaced by another, and that by a third, and so on till a sufficient number of different waved lines are obtained. A number of rosettes are generally

strung at once on the mandrel, and the fixed guide is brought into gearing by means of a steel band called a rudder, with one rosette after another. Similar concentric curves of greater or less perimeter are obtained by removing the slide-rest from, or bringing it nearer to, the axis of revolution.—For more complete information respecting this most interesting machine, and its many varieties of form and application, see article 'Turning' in the *English Cyclopædia*, Holtzapffel's *Turning and Mechanical Manipulations* (Lond. 1847—1852), and *Tourneur* (*Manuels-Roret*), by Valicourt (Paris, 1858).

TURNIP (*Brassica rapa;* see BRASSICA), a biennial plant, with lyrate hispid leaves; the upper part of the root becoming, especially in cultivation swollen and fleshy. It is a native of Europe and the temperate parts of Asia, growing in borders of fields and waste places. It is commonly regarded as a native of Britain, although in most cases of its being found apparently wild, it may be doubted if it has not derived its origin from cultivated varieties. It has been long cultivated, and is to be found in every garden of the temperate and cold parts of the world as a culinary esculent; it is also extensively grown in fields for feeding cattle and sheep. It was cultivated in India long before it could have been introduced by Europeans, and is common there in gardens and about villages. The cultivated varieties are very numerous. In them, the upper part of the root assumes a globose, oblong, or roundish depressed form. Some are common to the garden and the farm, and some of the largest kinds attain such a size as to weigh 20 or 25 lbs. Although the T. is of great value for feeding cattle, and the introduction of it into general field-culture was one of the greatest improvements ever effected in the husbandry of Britain, it is not very nutritious, no less than 90—96 parts of its weight actually consisting of water. Garden turnips are sown from the end of March to the end of August; field turnips generally in June, it being requisite that they should not be sown so soon as to incur a risk of their throwing up flower-stems in the first year, which, when it takes place, prevents in a great measure the swelling of the root, and renders it coarse and fibrous. In the garden cultivation of turnips, the root is generally intended for use in the first year. In dry weather, the plants are apt to throw up flower-stems, and so disappoint the hope of the gardener; which is also the case if the seed is sown too early in spring. Moist cloudy weather is most favourable. Garden turnips are sown, and allowed to grow, much closer than field-turnips; being gradually thinned out, and the thinnings used even when of small size. The varieties both of garden and field turnips are very numerous. The garden turnips are generally of comparatively small size, more rapid in growth, and more delicate.—The SWEDISH T., or RUTA BAGA, which was introduced into cultivation in Britain, from the north of Europe, more recently than the common T., and has proved of very great value to the farmer, is regarded by some botanists as a variety of the same species, and by some as a variety of *Brassica napus*, but more generally as a variety of *B. campestris*, a species common in corn-fields and sides of ditches in Britain and the north of Europe.

The cultivated T. grows best in a rich free soil. The mode of culture varies with the soil. Where the soil is light and dry, a smaller amount of ploughing, harrowing, and drilling is necessary than on stiff soils. The T. is not well suited to clay soils, although it is often grown on them. A complete pulverisation of the soil is requisite before the sowing of the seed. On light soils, a crop of turnips generally succeeds wheat or oats. T.-land is generally made up in raised drills, by the plough, and the seed is sown by the drilling-machine, on the top of the narrow ridges, which are about 27 inches apart. Small doses of guano, superphosphate of lime, crushed bones, or other such manures, produce great crops of turnips. They seem to act chiefly whilst the plant is young; and when it is further advanced, it derives nutriment from the soil, and even from the subsoil, by deeply penetrating roots, and from the atmosphere by its large leaves. See BONES AS MANURE. The young plants are thinned out by the hand-hoe, to a foot or upwards apart, and the ground is stirred and carefully kept clean by the plough or horse hoe. The T.-crop is thus of great use in clearing the land of weeds. In many places, part of the crop is eaten on the ground by sheep, which are confined to a small part of the field by means of movable fences. It is common to leave one of each three rows of turnips for this purpose, the other two rows being carried to the farmyard for feeding cattle, or stored. Turnips are stored either in a house, or in conical heaps, covered with their own leaves, or with straw and earth. They are sometimes protected from frost by being earthed up in rows by the plough. Some kinds are much more easily injured by frost than others; the Swedish turnips least of all.

The introduction of the T. as a field-crop is one of the most important events in the history of British agriculture. It has rendered possible a rotation of crops, which has been extremely advantageous, and has made the supply of butcher-meat more constant, by providing a supply of winter-food for cattle and sheep, whereas, formerly, all depended on the pasture. T.-husbandry was introduced into Scotland from Norfolk in the latter part of the 18th c., but soon attained a development, and was carried to a perfection in Scotland far beyond what it had previously reached anywhere. The climate of Scotland is particularly adapted to it, as is also that of Ireland; moist weather, both in summer and autumn, being suitable to the T.; whilst the climate of North America is so unfavourable to it, that it has not become an important crop there. Of late years, T.-crops in Britain have suffered very much from the disease called Anbury (q. v.), or *Fingers and Toes* This is not the case in Norfolk, and the exemption is supposed to be due to the use of clay-marl as a manure; but the whole subject is involved in obscurity. The T. not unfrequently suffers from a fungus of the genus *Botrytis* (*B. parasitica*), allied to that which is supposed to cause the potato disease. It infests plants of rank growth, attacking their roots, which are weakened by the too great luxuriance of the leaves. Plants weakened by drought are liable to suffer from a white mould, a species of *Oidium*, which attacks the leaves, and renders the plant worthless. The leaves are devoured by the T.-fly, T.-flea, or T.-beetle (*Haltica nemorum*), and by other species of the same genus. The Nigger Caterpillar, the larva of *Athalia spinarum*, also devours the leaves, as well as the caterpillars of White Butterflies (*Pontia brassicæ*, *rapæ*, and *napi*), and of some moths. The leaves are also mined by the larvæ of several dipterous flies. Several species of aphis suck the juices of the leaves, and one (*A. floris rapæ*) devotes its attention to the young crops in seed-leaf, which are also attacked by a rose-chafer (*Cetonia aurita*). and a minute beetle (*Meligethes æneus*). Slugs, snails, and wire-worms are among the enemies of the turnip.

The young leaves of the T. are good as greens

and particularly those of the Swedish T., when it has begun to sprout in spring.

TURNIP-CUTTER, an implement used for cutting turnips for cattle. It is useful, not only as saving the teeth of sheep, which are apt to be much injured by eating turnips, but as preventing waste, for sheep feeding upon turnips scoop out a part, and leave the rest to rot. The oldest and simplest turnip-cutter acts by mere pressure, and is like a large nut-cracker on a stand. Many kinds are now in use, of which perhaps the best are those having knife-edges on the surface of a cylinder or cone, which are brought to act on the turnips by turning a handle.

TURNIP-FLY, a name given to several insects destructive to turnips. It is often given to *Altica* (or *Haltica*) *nemorum*, also called TURNIP-FLEA, from its skipping or leaping powers, but which is truly a very small beetle, with long and strong hind-legs, and ample wings, of a shining black colour, with

Turnip-fly (*Anthomyia radicum*):
1, Maggot (magnified): 2, Pupa; 3, natural size: 4, Insect; 5, natural size.

two yellowish stripes down the wing-cases, and ochreous legs. It swarms in meadows and hedgerows in most parts of Britain from March to October, the larva feeding on many cruciferous plants. It often commits great ravages in turnip-fields, whilst the turnips are very young. The female lays her eggs on the under-side of the leaf, and the minute larva mines in the leaf, under the skin, making a tortuous gallery. Farmers sometimes steep the seed of turnips in order to prevent the ravages of this insect, but no good can be thus done, as the eggs are not in the seed.

The TURNIP-FLY, more properly so called, is *Anthomyia radicum*, a dipterous insect of the family *Muscidæ*, and of the same genus with the Cabbage-fly and Beet-fly. It attacks the root of the turnip, as the Cabbage-fly does that of the cabbage, the larva living in the root.

TURNIP SAW-FLY. See SAW-FLY.

TU'RNPIKE ROADS. See HIGHWAY, TOLL.

TURNPIKE STAIR, a turret stair revolving round a central newel.

TU'RNSOLE, a peculiar colouring material consisting of very coarse linen rags, usually pieces of sacking, prepared by cleaning and bleaching, and then dipped into the juice of the leguminous plant called *Crozophora tinctoria*, previously mixed with ammoniacal matter, and exposed to the air for some time. It is made in France, but is exclusively used in Holland, but for what is not certainly known: it is said, for colouring cheese, pastry, &c.

TU'RNSTONE (*Strepsilas interpres*), a bird of the plover family (*Charadriadæ*), very widely distributed, and, indeed, found in almost every part of the globe. It appears in Britain, chiefly as a winter bird of passage, but breeds in the Shetland Islands. It frequents the sea-shore, and derives its English name from its habit of turning over small stones with its bill in search of food. It is the only known species of its genus. The bill is longer

Turnstone (*Strepsilas interpres*).

than the head, conical, hard at the point; the neck short; the wings short, the tail short and pointed; the feet have a short hind-toe; the fore-toes are destitute of web. The whole length is rather more than eight inches. The upper parts are chestnut red, with black spots; the lower parts white, part of the neck and breast black.

TU'RPENTINE is a semi-solid resin which is yielded by various species of pine, and by some other trees when incisions are made into them. The chief varieties of turpentine are *Common Turpentine*, yielded by *Pinus australis; Venice Turpentine*, yielded by the larch; *Bordeaux Turpentine*, yielded by *Pinus maritima;* and *Chian Turpentine*, yielded by *Pistacia lentiscus.* The Venice turpentine, which is regarded as the best variety, occurs as a clear, transparent, pale yellow, viscous mass, of a balsamic odour, and an acrid bitter taste, perfectly soluble in spirits of wine, and increasing in density on prolonged exposure to the air. On distilling it with water, it yields a considerable quantity of essential oil, vulgarly known as *spirits of turpentine.* This *oil of turpentine* (which, from its greater cheapness, is usually obtained from common turpentine) is, after rectification, represented by the formula $C_{20}H_{16}$, and has a spec. grav. of 0·864, and a boiling-point of 320°. It is colourless, transparent, has a strong refractive power, a strong peculiar odour, and a disagreeable acrid taste. It is readily soluble in alcohol, in ether, and in the fixed and essential oils, but is insoluble in water, on which it floats. It is a good solvent for many substances, amongst which may be especially mentioned sulphur, phosphorus, caoutchouc, and the various resins; and is largely used in many departments of the arts, forming a large proportion of all oil paints. Great quantities are produced in North Carolina and other Southern States, mostly derived from *Pinus australis* and *Pinus tæda.*

Turpentine is an energetic producer of Ozone (q. v.); and on keeping it for a long time in a stoppered flask, which should be occasionally shaken, the odour of ozone is very distinct on opening the vessel. Oil of turpentine forms three hydrates, of which two are solid. Commercial oil of turpentine often consists of a mixture of several isomeric hydrocarbons which act oppositely on polarised light (like the several varieties of sugar). Deville and Berthelot have ascertained that there are various modifications of which this oil is susceptible without its undergoing any change in its chemical composition. Of these, *isoterebenthene* and *metaterebenthene* differ *inter alia* in their boiling-points, and may thus be separated; *terebene* (which has an odour resembling that of oil of cloves) and *colophene* are obtained by acting on the oil with sulphuric acid.

and *camphilene* and *terebilene* by decomposing artificial camphor (which is a combination of the oil with hydrochloric acid) by means of quicklime.

Under the influence of nitric, hydrochloric, and sulphuric acids, chlorine, &c., oil of turpentine yields many products of interest to the chemist, but as yet of little practical value.

Oil of turpentine is used to a considerable extent in medicine, although, from its disagreeable taste, and from certain bad effects which occasionally follow its use (as strangury, bloody urine, vertigo, a species of intoxication, and an eruption on the skin), it is often supplanted by less certain remedies. It is probably the most effective remedy for the expulsion of tapeworm, is nearly equally efficacious over the lumbrici or round-worms, and in the form of an injection is serviceable in the case of ascarides or thread-worms. For an adult, in a case of tapeworm or round-worm, the dose should be one ounce, combined with an equal quantity of castor-oil, or made into an emulsion with yolk of egg or mucilage. In the case of children and delicate women, it is better to try a milder vermicide (see VERMIFUGES). In doses of from two drachms to two ounces, and in similar combination with castor-oil, it may be given as a cathartic in cases of obstinate constipation, especially when dependent on affections of the brain; in hysteria, epilepsy, tympanitis, passive hæmorrhage, and in purpura hæmorrhagica, in which last-named disease Dr Neligan highly recommends it. In small doses (as from 10 to 20 minims), oil of turpentine is regarded as a diuretic; but it must be given with caution, in consequence of its stimulating properties. It is of more service in chronic mucous discharges of the genito-urinary organs, as gleet, leucorrhœa, &c., than in dropsy. In small doses, it is often useful in chronic rheumatism and in sciatica. In the Dublin school, it is much employed in small and repeated doses as a general stimulant in the low stages of continued fever. *Turpentine Punch* has long been a favourite remedy in the Meath Hospital (where Graves and Stokes made their reputation) in these cases. It is composed of an ounce of oil of turpentine, two ounces of brandy, eight ounces of boiling water, and a sufficient quantity of sugar. A third of this should be taken for a dose, and should be repeated if necessary every third hour. When applied externally, oil of turpentine is a speedy and powerful rubefacient and counter-irritant, and is beneficially used in this capacity in inflammatory attacks of the throat, chest, and abdomen. The best method to pursue is to rub the oil by means of a bit of flannel over the part to be acted on; over this to lay three or four folds of flannel, wrung out of hot water, and over the flannel to place a dry towel; two or three such applications produce a sufficient result. There is a *Liniment of Turpentine* which is powerfully stimulating, and is applied as a dressing for extensive burns; and is likewise used, with friction, in rheumatic and neuralgic cases. There is also the *Liniment of Turpentine and Acetic Acid*, which is the officinal representative of the well-known *St John Long's* liniment, and is an excellent counter-irritant (applied with a sponge) in pulmonary consumption and other chronic pulmonary affections. Lastly, *Ointment of Turpentine*, a warm stimulating application, requires mention.

It was mentioned at the beginning of this article that on distilling turpentine with water, the oil comes over. The residue left in the retort constitutes common *resin* (or *rosin*), known also as *colophony*. See RESINS.

TURPENTINE TREE. See PISTACIA.

TURPIN Archbishop of Rheims, friend and companion of Charlemagne, and eye-witness of the exploits he relates—such are the names and qualifications assumed by the author of a chronicle in Latin prose narrating the expedition of the Frankish emperor against the Saracens of Spain, and particularly the events that preceded and followed the battle of Roncesvalles (q. v.). That a Bishop Turpin existed about this period, is admitted, but the very documents in which he is mentioned, state that he was slain at Roncesvalles. There was also an Archbishop Turpin of Rheims (753—800 A. D.), but he has no claim to the description given above; and, in fact, all internal evidence leads to the conclusion that it is a work of the 11th century. It seems to have sprung out of the epic ballads and traditions of the Carlovingian heroes, while these were still in a comparatively pure condition; but through the legendary manner in which they are told, there is visible a monkish aim—viz., to encourage the foundation of churches and monasteries, the undertaking of religious wars against the Saracens, and above all, the pilgrimage to San Jago de Compostella. Now, as in the year 1190, a brother of the Archbishop of Vienne (subsequently Pope Calixtus II.) obtained by marriage the countship of Galicia; as it was from Vienne that the pseudo-Turpin's chronicle was recommended to the rest of Christendom; as the same archbishop was detected on several other occasions fabricating false documents; as subsequently, in his quality of pope, he himself pronounced the chronicle authentic in a bull of 1122 (the authenticity of which has, however, been questioned); as he pursued the same family policy in his acts as pope, and in his sermons in honour of San Jago; finally, as the chronicle of the pseudo-Turpin is very often followed in the MSS. by a dissertation of Calixtus upon the miracles of San Jago, it has seemed to critics highly probable either that Pope Calixtus wrote the work himself, while yet Archbishop of Rheims (*circa* 1090), or, at least, that he took an important part in its composition. The book soon acquired a great popularity, was translated into French after 1206, and was made use of by divers chroniclers, as the author or authors of the *Chroniques de Saint-Denis*, Vincentius Bellovacensis, &c. The chronicle is of great historic value, in spite of all the embellishments it has from time to time received; for, as one of the most ancient traditions of the time of Charlemagne, it has preserved numerous traits and details with more purity and fidelity than the poems of the Carlovingian cycle, which are generally of later date. The chronicle has been printed in Reuberus's edition of the *Scriptores* (Hanau, 1619; Frank. 1726), but see more particularly Ciampi's *De Vita Caroli Magni et Rolandi Historia, J. Turpino vulgo tributa* (Flor. 1822).

TU'RPIS CAU'SA, a phrase in the Law of Scotland borrowed from the Roman law, to express an immoral consideration on which some contract or obligation is founded. The rule is, that when an immoral contract is broken, no court of law will assist either party to enforce it. Thus, if a man were to let lodgings to a prostitute, with the knowledge that the lodgings were to be used for carrying on her vocation, he would have no right to bring an action to recover rent.—The same is the rule in English law.

TURQUOISE, a mineral hitherto found only in the province of Khorassan, in Persia, and much prized as an ornamental stone. It is essentially a phosphate of aluminium, containing also a little oxide of iron and oxide of copper. It is harder than felspar, but softer than quartz, and has a greenish-blue colour. It is opaque, or sometimes

translucent at the edges. It is sometimes called Oriental T.; whilst the name Occidental T. is given to a substance of similar colour, found near Simon, in Languedoc, which is said to be merely bone coloured with phosphate of iron.

TURRET-SHIP, an invention of the last few years in naval warfare, consists of an iron-plated vessel rising but slightly above the water, with bulwarks which, by means of hinges, can be lowered out of the way of cannon shot. In the middle of the deck are one or more turrets encased in the most massive plates, and holding each one or two guns of heavy calibre. The turret, in American vessels, is pivoted on the keel or other firm base; in English specimens it revolves on rollers under the periphery. By means of simple mechanism, it can be made, either by a steam-engine or by hand, to revolve with considerable speed, thus giving the gun a range in every direction. Turret-ships were first proposed by Capt. John Ericsson, of New York, in 1854, but were claimed by and patented in Great Britain by Captain Cowper Phipps Coles of the royal navy, who, after much discussion with the Admiralty, was allowed to adapt the *Royal Sovereign*, a wooden vessel which had been built for a three-decker, to his designs. The plan was tried under disadvantages, as the ship had not originally been destined for such heavy work. Notwithstanding, the *Royal Sovereign*, as a turret-ship, has been

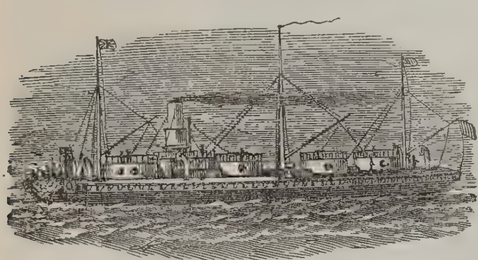


Fig. 1.—Turret-ship, *Royal Sovereign*.

declared by competent officers to be the most powerful vessel in the British navy. A turret of this vessel was subjected in June 1866 to a tremendous test by being repeatedly fired at, from a short distance, by a very heavy gun. The iron-plating was damaged, especially at the embrasure; but the turret was found, its concussions notwithstanding, to revolve with the same ease as before the trial. Almost simultaneously in the United States, similar vessels, called 'Monitors,' sprang into

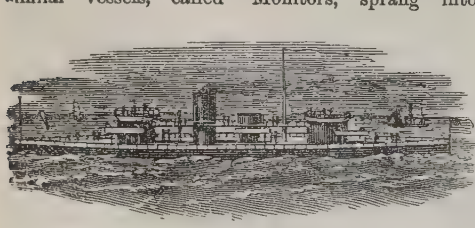


Fig. 2.– American Turret-ship, *Miantonomah*.

existence, the principal point of difference between them and the British build being that their hulls are almost entirely submerged, the turrets being wholly above the upper deck; while, in the latter, the hulls rise higher from the water, and the turrets are sunk below the deck, except in so far as is absolutely necessary for discharging the ordnance. It has for several years been in dispute whether to trust to turret-vessels or to ships with their battery in broadside. Under the administrations of Lords Palmerston and Russell, the Admiralty have built broadside vessels. Lord Derby's government signalised their accession to power in 1866 by immediately ordering four iron turret-ships of immense power and 4000 tons each.

Among the advantages claimed for turret-ships

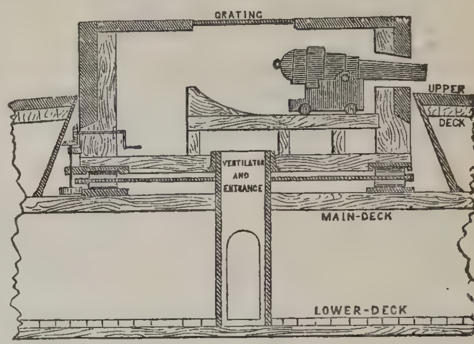


Fig. 3.

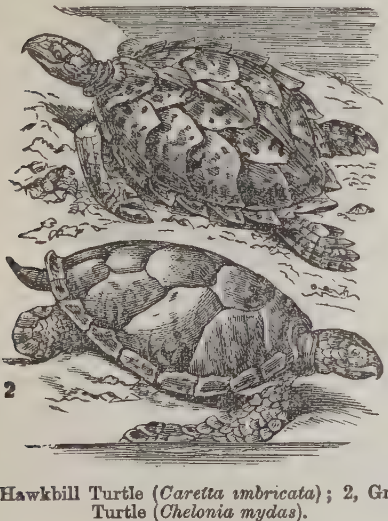
are—that much heavier ordnance can be carried centrically than at broadside, with equal dislocating pressure on the keel; that in a sea the platform from which aim is to be taken is steadier at the centre; that the mark offered to the enemy is smaller; and that the gunners are safer, as the turret can be turned with its port-hole away from the enemy during loading. The turret-ship "Captain," regarded by the English Admiralty as a perfect armoured ship, was constructed on the plan of Capt. Coles. But the vessel was top-heavy, and overturned in a storm, and Capt. Coles and 500 of his comrades perished. See Norton and Valentine, Rep. on *The Munitions of War, Paris Exhibition*, 1867, Washington, 1868.

TURRITE'LLIDÆ, a family of gasteropodous molluscs, having a much elongated spiral shell, the lower spires remarkably separated. The name Turret-shell is often given to them.

TURTLE, the popular name of those Chelonian reptiles, the family *Cheloniadæ* of some, which have a rather flat carapace, and fin-like paddles instead of legs, suited for swimming, and not for walking. The fore-limbs are much longer than the hind-limbs. The toes are not all furnished with nails; in some species, there is only one on each foot, in others there are two. Turtles are all marine, and although they lay their eggs on the beach, seldom visit the shore for any other purpose. They deposit their eggs in holes, which they scoop in the sand with their hind-feet. The eggs are numerous, one hundred and fifty or two hundred being often deposited at a time, and the T. lays several times a year. The young, soon after being hatched, make their way through the sand which covers them, and immediately betake themselves to the water. The eggs are hatched by the heat of the sand alone, and the young receive no attention from their parents. Turtles crawl slowly and awkwardly on the shore; but their movements in water are comparatively quick, and even graceful. Some of the species feed entirely on grass-wrack and sea-weeds, which their powerful, hard, and sharp-edged jaws cut with great ease: others prey on crustaceans, molluscs, and fishes. Their jaws are powerful enough to crush very large shells, and the carnivorous turtles are in general more rapid in their movements than the

others. The flesh of those which subsist on animal food is musky and unpleasant; but that of the species whose food is vegetable is much esteemed. In many tropical countries, turtles, after being captured, are kept in enclosures to which the tide has access, to be killed when they are wanted. They are capable of subsisting long without food, and are imported alive from the West Indies into Britain, to supply the tables of the wealthy. In tropical countries, turtles are often very cheap. Their eggs are a much-esteemed article of food in the countries where they are found, and are sought for by probing the sand with a light stiff cane in the places known to be frequented by turtles. Turtles are easily taken when they come ashore for the purpose of laying their eggs, and one after another may be turned on its back—in which position it is helpless, and cannot make its escape—till a sufficient number is secured. They are also, however, taken in the sea, being cautiously approached by boats when resting, or apparently sleeping, at the surface, or by divers when descried at the bottom in their feeding-grounds. A small harpoon is used, or a rope is thrown over the head of the turtle. Turtles are sometimes pursued by boats in shallow parts of the sea until they are exhausted, the clearness of the water permitting them to be seen even when they dive; and when the boat gets near enough, a man leaps overboard, and seizes the T., clinging with both hands to the shell. It is said that at Mozambique a species of sucking-fish (*Echineis*) is used for catching turtles, a cord being attached to the fish, which is allowed to swim away in the sea, and is sure to fasten itself firmly to the first T. it meets.

The most esteemed T. of the West Indies is the Green T. (*Chelonia mydas*), which is the only kind imported into Britain for aldermanic and other feasts. The Green T. attains a large size, being sometimes six or seven feet in length, and weighing 700 or 800 lbs. The plates of its carapace do not overlap one another; the central ones are almost regular hexagons. The popular name is derived not so much from the external colour, which is mostly a dark olive, passing into dingy white, as



1, Hawkbill Turtle (*Caretta imbricata*); 2, Green Turtle (*Chelonia mydas*).

from that of the fat, so much prized by epicures.—Another excellent species of T. is the Edible T. (*Chelonia virgata*) of the East Indies, which is frequently four or five feet long.—The Hawkbill T. (*Caretta imbricata*), found in the warmer parts of the Atlantic Ocean, in the Indian Ocean, and in the Red Sea, is particularly valuable, as yielding the best Tortoise-shell (q. v.). It is one of those turtles which have the plates of the carapace imbricated, or overlapping one another like tiles. Its flesh, although not so much esteemed as that of the Green T., is a good article of food; its eggs are also very good.—There are other turtles, having the head of a larger size, and the jaws curved towards one another at the extremity, of which one is the Loggerhead T. (*Caouana olivacea*), a native of the warmer parts of the Atlantic, and a very rare visitant of the British seas. Others, again, have the carapace and plastron not hard, but leathery, and sometimes soft enough to yield to the pressure of the finger. One of these is the Coriaceous T. (*Sphargis coriacea*) of the Mediterranean and Atlantic, occasionally, but rarely, found even on the British shores. It attains a very large size, even greater than any of the species already described, but its flesh is coarse and unpleasant.

The French, encouraged by their success in pisciculture, have attempted to introduce the Green T. on the southern coasts of France. There has not yet been time to prove the success of the experiment.

TURTLE-DOVE, or TURTLE (*Turtur*), a genus of *Columbidæ*, having the bill more slender

Turtle-dove (*Turtur communis*).

than pigeons, the tip of the upper mandible slightly bent down. They are also more slender and elegant in form than pigeons, and generally smaller; the wings are longer and more pointed; and the tail is longer, rounded, or slightly graduated. There are numerous species, natives of warm climates. Their soft and gentle, yet loud *cooing* has attracted attention even more than their beauty, and made them a favourite subject of allusion in poetry. *T. risorius*, the most common species in Palestine, and probably the one intended in the Song of Solomon, is about ten inches in entire length, with a short tail; the general colour gray tinged with red; the upper parts greenish brown, with a black collar on the back of the neck. It is often kept in confinement, and becomes very tame.—Very similar to this in size and form is the Common Turtle-dove (*T. communis*), a native of almost all the warmer parts of the Old World, a summer visitant of the south of Europe and of England, where it is chiefly found in the south-eastern counties. In Kent, flocks of twenty or more are often to be seen, particularly in the pea-fields. The tail is long, and much rounded; the plumage soft, and without gloss, exhibiting finely-mingled tints of gray and brown; the crown of the head bluish; all the tail-feathers tipped with white; a black patch on each side of the neck. Other species of turtle-dove, from different parts of

the world, as well as these, are not unfrequently kept in confinement, and are very gentle, if not very intelligent pets. Their cooing resounds through a whole house.

TU'SCAN ORDER OF ARCHITECTURE, one of the five Classic Orders (q. v.), being a Roman modification of the Doric style with unfluted columns, and without triglyphs. It is the simplest of the orders.

TU'SCANY, formerly a sovereign grand duchy in the west of Italy, lying for the most part, but not wholly, south and west of the Apennines, in lat. 42° 20′—44° 10′ N., and long. 10° 15′—12° 20′ E. Area, 8440 sq. m.; pop. in 1860, at the date of its annexation to Sardinia, 1,800,000. The north and north-east of the country is filled with mountains, whence numerous rivers and streams flow down to the sea, the most important of which are the Arno (q. v.), the Serchio, and the Ombrone. This district is also the source of the Tiber (q. v.). The rest of T. is an undulating region of hills and dales, except the coasts, which are flat and marshy. Of these marsh-lands, the largest is (or was) the *Maremma* (q. v.). The principal crops are maize, wheat, rye, and barley. Wine and oil are also abundantly produced. Mules, cattle, and sheep are reared in great numbers; there are flourishing manufactures of silks, woollens, and straw (for hats); and a very considerable trade is carried on in articles in marble, alabaster, porcelain, coral, wax, &c. The chief town, Florence, was the capital of Italy prior to 1871. Other important places are Leghorn, Pisa, Siena, and Arezzo.

The ancient history of T. is described at length in the article ETRURIA, and its medieval history in the article FLORENCE. It is only necessary to add, by way of elucidation, that modern T. was first constituted in its present dimensions in 1569, when Cosmo de Medici became Grand Duke of Tuscany. On August 16, 1860, the national assembly of T. pronounced the deposition of the reigning dynasty; and four days later, declared for annexation to Sardinia.

TUSCARO'RAS, a tribe of North American Indians, who, at the settlement of North Carolina, had 15 towns on the Tar and Neuse rivers, and 1200 warriors. In 1711, they began a war with the settlers, and after a series of savage encounters, were defeated, and joined the Iroquois in New York, where they became allies of the English, and where about 50 families still reside on an Indian Reservation in the western part of the state.

TU'SCULUM, anciently a city of Latium, about 15 miles south of Rome, was situated on a ridge of hills known as the *Colles Tusculani*, and forming part of the Alban range. We ought not to infer from its name (as Festus does, *s. v. Tuscos*) that it had any connection with the Etruscans. Mythically, it derived its origin from Telegonus and Circe; but we catch the first certain glimpse of its historical existence towards the close of the regal period at Rome. Then, however, it appears in the enjoyment of a high degree of prosperity and power, and therefore its beginnings are in all probability remote. Octavius Mamilius, ruler of T., and the foremost prince in Latium, married a daughter of Tarquin the Proud (see TARQUINIUS), and played a conspicuous part in the last of the great struggles made by the banished tyrant to regain his kingdom. On that occasion, the Latins were so thoroughly beaten (see REGILLUS LAKE) that they were fain to enter into an alliance with the victor, and ever after —except in the single instance of the Great Latin War (340—338 B. C.)—remained steady in their attachment and fidelity to Rome. As early as 378 B.C., the inhabitants of T. received the Roman franchise, and among its many distinguished *gentes* may be specially mentioned the Porcian, which produced two famous men of a thoroughly 'Roman' stamp, Cato *Major* and Cato *Minor*. Towards the close of the Republic, T. became a favourite country residence of the wealthy Romans. Lucullus had a villa here (with parks and gardens extending northwards for miles); so had Cato, Brutus, Hortensius, Crassus, Cæsar, and Cicero. The villa (*Tusculanum*, Tusculum House) of the great orator is peculiarly memorable as the place where he composed many of his philosophical works, and particularly those charming dialogues (*Tusculanæ Disputationes*) which derive their name from it. Long after the Western Empire had fallen, T. continued to flourish. As late as the 12th c., the ancient city continued entire; but in 1191 it was stormed by the Romans (between whom and the Tusculans there had long been a deadly feud), and razed to the ground. It never recovered from this blow; but lower down there arose from its ruins, if we may so speak, the town of Frascati (q. v.). Many fine remains of ancient T. have been dug up in recent times, the most remarkable, perhaps, being the amphitheatre, theatre, and city walls.

TU'SSAC GRASS (*Dactylis cæspitosa*), a large grass of the same genus with the Cock's-foot Grass of America, a native of the Falkland Islands, remarkable for forming great tufts, sometimes five or six feet in height, the long tapering leaves hanging over

Tussac Grass (*Dactylis cæspitosa*).

in graceful curves, from five to eight feet long, and an inch broad at the base. It is, however, sufficiently delicate to be very good food for horses and cattle; and the attention of British farmers having been very strongly called to it, it has been tried with success in the Hebrides, Orkney Islands, and other localities in which there is a peaty soil exposed to winds loaded with sea-spray, to which it promises to be a very valuable acquisition. The inner part of the stem, a little above the root, is soft, crisp, flavoured like a hazel-nut, and often eaten by the inhabitants of the Falkland Islands. The young shoots are boiled and eaten as asparagus.

TUSSILA'GO, a genus of plants of the natural order *Compositæ*, sub-order *Corymbiferæ*, having

bracteæ with a membranous edge, a naked receptacle, a hairy pappus; the florets of the ray pistilliferous, in many rows, tongue-shaped; those of the disc perfect, few. *T. farfara*, sometimes called COLT'S-FOOT, is found in New England and New York. It has single-flowered scaly scapes, appearing before the leaves in early spring, the flowers yellow, both disc and ray; the leaves heart-shaped, angular, downy beneath. The leaves have a somewhat glutinous

Colt's-foot (*Tussilago Farfara*).

and subacrid taste, and are used either by smoking, or in the form of a decoction, for relief of asthmas and troublesome coughs. They have been used with advantage in scrofula.—Nearly allied to this genus is *Petasites*, of which one species, the BUTTER BUR (*P. vulgaris*, formerly *Tussilago Petasites*), is a native of Britain. The leaves resemble those of *Tussilago Farfara*, but are much larger; the flowers also appear before the leaves, but in a dense thyrsus, and are of a pale flesh-colour. The flowers of both are much sought after by bees, as are those of *Petasites* (formerly *Tussilago*) *alba*, and *P.* (formerly *T.*) *fragrans*, natives of the south of Europe, not uncommon in British flower-gardens.

TU'SSOCK MOTH (*Laria pudibunda*), a grayish-white moth, about an inch long, the upper wings freckled, with four irregular darkish lines, the under

Tussock Moth and Caterpillar.

wings nearly white. The caterpillar does great mischief in hop plantations, and is known by the name of *Hop-dog.*

TUTOR, in the Law of Scotland, means a guardian of the person as well as of the estate of a boy under 14, or a girl under 12; that is, while they are in a state under that of puberty. At common law, a father is both tutor and curator of his children. Tutors are divided into three kinds: tutors nominate, tutors at law, and tutors dative. A tutor nominate is he whom the father, who has the sole power of naming a tutor, has appointed by will or deed. Sometimes several are appointed to act jointly. In general, no security is required from a tutor nominate, because the father's choice implies that the tutor is a trustworthy person. Yet, if he is *vergens ad inopiam*, or of doubtful character, security will be required. Tutors at law are those whom the law will appoint in a certain order of relationship, if there is no tutor nominate. No cognate, i.e., no relation by the mother's side, will be appointed; but the nearest agnate, i.e., a person related through the father, will be appointed, if a male, and of the age of 25, and able to give security. The tutor, however, has only the custody of the pupil's estate, while the custody of the pupil's person is given to the mother or nearest cognate. A tutor dative is named by the crown when there is no tutor nominate or tutor at law. Tutors other than tutors at law have the custody of both the person and estate of the pupil, and act alone for the pupil, suing for and discharging all debts due, and managing the property. The tutor's office is gratuitous, and he is not allowed to derive any profit from it, or to do acts inconsistent with his duty. For some purposes, however, such as selling the pupil's land, he must have the sanction of the Court of Session. He is bound, on entering office, to make up an inventory, and must keep proper accounts.

TU'TTLINGEN, a town of Würtemberg, on the right bank of the Danube, 20 miles west-south-west of Sigmaringen. It has manufactures of knives, needles, cloth, cotton, hosiery, linen, and silk, and carries on besides some trade in corn. Pop. 7031. T. is historically notable as the scene of a battle in 1643, during the Thirty Years' War, in which an Austro-Bavarian force, under Hatzfeld and Mercy, defeated the French.

TUTTY-POWDER, an impure oxide of zinc, which is found in the chimneys of the furnaces in which the ores of that metal are roasted. It has some value in medicine.

TUTUI'LA, an island in the Pacific, belonging to the group of the Navigators' or Samoan Islands (q. v.), is about 17 miles long and 5 miles broad, and is said to contain nearly 5000 inhabitants. The coast is bold, and the island is traversed by sharp-peaked mountains, highly picturesque in outline, and rising to from 2500 to 3500 feet. The harbour of Pago Pago, an ancient crater, is very deep, and completely landlocked by lofty mountains. The mountains are clothed with dense green forests, comprising the bamboo, banana, cocoa-nut tree and other palms. Between the months of November and May, fearful hurricanes break over the island, and so powerful is their effect, that they are said by the natives to *skin the land.*—*Cruise of H.M.S. Fawn*, by T. Hood (Edmonston and Douglas, Edin. 1863).

TU'YERE, the nozzle or small pipe through which the air is forced into a blast-furnace.

TVER, a government of Great Russia, bounded on the N.-W. by the government of Novgorod, and on the S.-E. by those of Moscow and Smolensk. Area, 26,031 sq. m.; pop. 1,518,077, mostly Russians. In configuration, the government is an elevated table-land, forming part of the Valdaï plateau, which

throws off rivers that run north-west into the Baltic, and south-east into the Caspian Sea respectively. The chief rivers are the Volga, with its affluents, the Tvertza and the Mologa; the Western Dwina, the Msta, and the Tsna. Most of these rivers rise in the north-west of the government, where there are numerous lakes. The climate is somewhat severe; the soil is not fertile, the most of the government being in marshes, and in woods and tracts of turf, the working of which, however, is as yet insignificant. Rye and oats are the only cereals produced with success. The employments of the inhabitants are principally agricultural; but other modes of industry are gradually developing themselves, especially along the great commercial highways of the government; 50,000 men are employed in the lake-fisheries, which are important, and in the conveyance of goods.

TVER, a city of Great Russia, capital of the government of the same name, stands at the confluence of the Volga with the Tvertza, 348 miles south-east of St Petersburg, by the St Petersburg and Moscow Railway. The Volga, which is here wider than the Thames at London Bridge, becomes first navigable for steamers at this town, although there is much difficulty in accomplishing the voyage hence to Nijni-Novgorod, when the water is low. Among the important buildings of T. are 2 monasteries, 23 churches, and 47 factories of different kinds, of which the chief is the cotton-mill of Kaoulin and Zologin, in which 1500 people find employment. Nail-making is an important branch of industry. The situation of T. is very convenient as a landing-place, in consequence of the St Petersburg and Moscow Railway here meeting the Volga, the principal artery of the commerce of the interior of Russia. The commercial prosperity of the town is continually increasing. Cereals and iron brought from Siberia are the chief articles of commerce, and besides the articles already mentioned, linen, leather, and paper are largely manufactured. Pop. about 30,000.

TWEED, the most famous of Scottish rivers, rises in the extreme south of Peeblesshire, at an elevation of 1500 feet above sea-level. It flows north-east to near Peebles, thence east by south to its junction with Ettrick Water, and thence in an easterly and finally north-easterly direction to its embouchure in the North Sea at Berwick-on-Tweed. The river drains great part of Peeblesshire, traverses the northern districts of Selkirk and Roxburgh shires; and in its lower course it forms the boundary between Berwickshire on the north-west and the English border-land on the south-east. It receives the Ettrick, the Teviot, and the Till from the south; and the Gala, Leader, and Adder from the north. The T. passes Peebles, Innerleithen, Melrose, Dryburgh Abbey, Kelso, Coldstream, and Berwick, where it falls into the sea after a course of 96 miles, and having drained an area estimated at 1870 sq. m. —greater than that of any other Scottish river, except the Tay. The highest regions through which the river flows are for the most part of the nature of moors; the middle course of the river is through narrow valleys, flanked by hills, clothed with woods or in pasture; and its lower course, through widespread valleys, picturesque and beautiful, and through the rich plain of the Merse (see BERWICKSHIRE), has many attractions. The tide is felt at Norham Castle, ten miles from the mouth of the river; but there is little or no navigation above Berwick. Possibly the T. owes its fame more to the associations which connect themselves with it, than to the charms of the scenery through which it flows. Traversing the heart of the 'Borders,' it has been witness to many a foray between the warrior-farmers north and south of its banks, as well as many a deadly struggle between the rival Houses of the south of Scotland; and its name is frequent in ballad and story. The T. is famous as a salmon and trout stream.

TWEEDMOUTH. See BERWICK-ON-TWEED.

TWEEDS, a name given to a certain kind of woollen cloth, largely made at Galashiels, Hawick, Selkirk, Jedburgh, and a few other places on the Tweed and its tributaries. It is prepared chiefly for men's apparel, and is of an open, soft, flexible nature—differing from English superfine cloth in not being so finely spun or closely woven, but most of all in not being so thoroughly felted. Tweeds are further characterised by their purity of colour and genuineness of make—shoddy, mungo, and cotton-warp not being yet used in the production of even the cheaper kinds. It is a manufacture of comparatively recent date. Seventy-five years ago, Galashiels, a principal seat of the manufacture, was only a small village; its few weavers individually manufacturing a species of coarse woollen cloth called 'Galashiels gray,' made from wool grown on the surrounding hills. About forty years later, the fabric was so far improved, that its use was no longer confined to the Border shepherds, but it had begun to be more or less worn by all classes in towns. The warmth, comfort, and durability of tweeds, as well as their suitability for all seasons, gradually led to their being preferred to the hard tartans, Manchester linens, and Nankeens of former days; and eventually, even to English doeskins. The demand for them rapidly increased. Galashiels has become a considerable town, and many large mills are now in active operation on the Tweed and its 'waters,' although they have for many years ceased to furnish power enough for the machinery. Nor has the manufacture confined itself to Tweedside, but has spread northwards to Aberdeen, Elgin, and Inverness; and southwards to Dumfries, and into Cumberland.

The wools used in the production of tweeds are principally Cheviot, South American, and Danish, for the coarser kinds; and Australian, New Zealand, and Saxony for the better qualities. Both fleeces and lambs' wool of the various kinds are employed—frequently in the proportion of two parts of the former to one of the latter.

The processes of spinning and weaving are similar to those adopted for English woollen cloth, the machinery, in fact, being, in the main, exactly the same. Tweed yarns are dyed before being woven, as their different colours are essential in giving variety to the patterns. Sometimes three or four colours are spun or twisted into one thread. Power-looms are employed in weaving, with, of course, the necessary mechanism for producing the great variety of patterns which is characteristic of the trade. As has been already said, the chief difference between broadcloth and tweeds, irrespective of pattern, arises from the milling, which, in the case of the latter, only occupies a few hours; but with the former, is prolonged for two or three days. The result is that the broad-cloth is so completely felted that the surface betrays no appearance of weaving; but in tweeds this can usually be distinctly seen.

Tweeds were at first all shepherd checks; but they are now made into many different kinds of checks and stripes, as well as plain styles; besides an endless variety of mixtures known under the general name of fancy tweeds. This manufacture, now one of the great staples of Scotland, seems to be rapidly increasing. The following figures exhibit the

advance made in Scotland in the manufacture of fabrics of this class from 1851 to 1862:

	1851.	1862.
Number of Factories,	72	82
" Power-looms,	329	1069
Sets of Carding-engines,	225	305
Value of Goods made, about	£600,000	£1,600,000

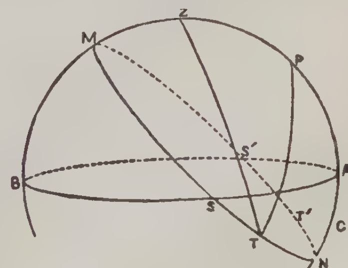
The Jury Report on the woollen goods exhibited in the International Exhibition of 1862, remarks: 'To the Scotch manufacturers belongs the credit of having found out what the public like, and of having led for a considerable period the public taste. So largely have their productions been imitated on the continent, that many of the choicest fancy trouserings of France and other countries are easily traceable in design and colouring to their Scotch origin.'

TWELFTH-DAY. See BEAN-KING'S FESTIVAL, and EPIPHANY.

TWELVE TABLES (Lat. *Lex* or *Leges Duodecim Tabularum*), the name given to the earliest code of Roman law. According to the ancient account, the code originated in this wise: In the year 462 B. C., a tribune, C. Terentilius Arsa, brought forward a proposal to appoint five men to draw up a set of laws, with the view of limiting the *imperium* of the consuls. The aristocracy, always furious, selfish, and unwise in their struggles with the commons of Rome, violently resisted this reform, and for eight years a fierce parliamentary warfare—if we may so call it—was carried on between the two orders, which ended in a sort of partial victory for the plebeians; that is to say, in 454 B.C., the senate assented to a *Plebiscitum* (see PLEBISCITE), in virtue of which three commissioners were despatched to Greece to report on the laws in force among the different states there. After a lapse of two years, they returned; and it was then agreed that ten men (*decemviri*) should be selected to draw up a code (*legibus scribundis*); but the patrician or aristocratic party took care that these decemvirs should all be chosen from their body. The story of the political fortunes of the Decemviri (q. v.), and of the fate of the leading decemvir, Appius Claudius (q. v.), are well known, though we believe that it has not come down to us in a very historical dress; indeed, it is politically quite unintelligible in the main. But what concerns us here is not the political career of these men, but the character of the legislation ascribed to them. We say ascribed to them, for the whole story of the foreign travels of the commissioners, and of their eclectic procedure in the matter of the Solonian and other laws, is so completely at variance with the simple, narrow, *home-centred* feelings of the Roman people at that early time, and with the thoroughly *Italian* stamp of the legislation embodied in the 'Twelve Tables,' that it has very reasonably been doubted whether such a commission ever existed, or, if it did, whether it did not acquire its information from the Hellenic cities of Lower Italy. Niebuhr, however, thinks the embassy to Greece just possible, though he is obviously reluctant to go further, and affirm that it really did occur (*Lect. Rom. Hist.*, vol. i. p. 296), and points out very clearly the difference between the Roman and Greek laws. 'All,' says he, 'that is distinctive in the Roman law, is not to be found in the Athenian; and distinctive it is with regard to the rights of persons and things. Never had the Greeks the right of paternal authority, like the Romans; never the law, that the wife, by her marriage, entered into the relation of a daughter and co-heiress; never the *jus mancipii*, the formality in the purchase. The difference between property by formal purchase and simple property, between property and hereditary possession, does not exist in the Attic law; the Roman law of inheritance, the Roman law of debt, the Roman system in contracts of borrowing and lending, are quite foreign to the Athenians' (*Lect. Rom. Hist.*, vol. i. pp. 295, 296). These differences, and the number could easily be enlarged, have induced modern historians to adopt the theory—if, indeed, that should be called a 'theory' which, in the eyes of all sound investigators, is a demonstrated fact—viz., that the Twelve Tables, instead of being an eclectic assortment of foreign laws, hitherto unknown to the people of Rome, and imposed on them for the first time, really expressed the first effort towards the codification of the consuetudinary law of the Latin race.

According to Livy (iii. 57) and Diodorus (xii. 56), the laws of the Twelve Tables were cut on bronze tablets (whence their name), and put up in a public place. Whether these tablets were destroyed by the Gauls when they sacked and burned Rome (390 B. C.), is uncertain. At all events, the later Romans entertained no doubt that the collection which existed in their time was genuine. The only portions extant are those which have been quoted by jurists and others. The Twelve Tables is described by Livy (iii. 34) as the *fons publici privatique juris*—the fountain of public and private law. Cicero (*de Or.* i. 43, 44) speaks of them with high praise. In the course of years, the *Jus Publicum*, as could not fail to be the case, was greatly changed, but the *Jus Privatum* of the Twelve Tables continued the fundamental law of the Roman state. See George Long's article 'Lex,' in Smith's *Dic. of Gr. and Rom. Ant.*; Niebuhr's *Lect. Rom. Hist.* (English translation, vol. i. pp. 295—319), Mommsen's *Hist. of Rome* (English translation, vol. i. book i. chap. 11, and book ii. chap. 2). The most complete essay on the history of the extant fragments of the Twelve Tables is to be found in Dirksen's *Uebersicht der bisherigen Versuche zur Kritik, und Herstellung des Textes der Zwölf-Tafel-Fragmente* (Leip. 1824).

TWILIGHT. If the earth had no atmosphere, we should be involved in total darkness from the instant of sunset till the instant of sunrise. The transition from day to night, and from night to day, occupies an interval which varies with the latitude and the declination of the sun, and this intermediate stage is called twilight. As long as the sun is not more than 18° below the horizon, its light is reflected by the air and the clouds and vapours suspended in it, in sufficient quantity to render even distant objects visible. The question of the duration of twilight is, therefore, simply reduced to this: How long, after sunset, or before sunrise, does the sun reach a position 18° below the horizon of a given place? And this can be answered easily by calculation in spherical trigonometry. Thus, if Z be the zenith, P the



pole of the heavens, ASB the horizon, and MSTN the (small) circle which the sun describes about the pole; there is twilight while the sun moves from T

to S, ZT being an arc of 108°. In the spherical triangle ZPT, we know the three sides, for ZP is the colatitude of the place, PT the sun's polar distance, and ZT is 108°. Hence we can calculate the angle ZPT, which is the sun's *hour-angle;* and from this we find at once how long before or after noon the sun passes the point T. If ZT′ be also 108°, we see that it is night while the sun moves from T′ to T, day while it moves from S (through M, its meridian position) to S′, morning twilight from T to S, and evening twilight from S′ to T′. Make ZC = 108°, then, if PN be less than PC, but greater than PA, there will be no point of the sun's path (MS′NS) so far as 108° from Z; and therefore the points T and T′ will not exist. In this case the sun will set and rise, but there will be *no night*, or, rather, twilight will occupy the whole interval from sunset to sunrise. This cannot occur in low latitudes, but does occur during certain periods of the year in northern and southern countries. For

PN is 90° − sun's declination,
PC is latitude + 18°,

and our condition is, therefore, that 90° − sun's declination, while greater than the latitude, does not exceed it by more than 18°. Or, in a simpler form, the latitude, together with the sun's declination, must lie between 90° and 72°. Now, the sun's greatest declination is about 23° 30′, and therefore, in lat. 48° 30′ (72° − 23° 30′), there will be one night in the year (at the summer solstice) consisting wholly of twilight; for higher latitudes, more; and for lower, none. Some curious problems on this subject, such as the finding the time of year at which the twilight is longest in a given latitude, were among the early triumphs of the differential calculus. A curious phenomenon, known as the *afterglow*, or second twilight, often seen in the Nubian desert, is referred by Sir John Herschel to a *second* reflection of solar light in the atmosphere. Lambert and others had previously speculated on the possibility of second and even third twilights, but in their time there was no recorded observation of such appearances.

Attempts have been made to deduce from the duration of twilight the height of the earth's atmosphere; and from various measurements which have given results agreeing fairly with each other, 50 miles has been assigned as a probable value. But, till we know more of the law of temperature in the atmosphere, we have no very direct means of testing the correctness of such results. In all probability, they are too small, as, indeed, we might expect, if we suppose the higher regions of the atmosphere to be much attenuated, and, therefore, reflecting little light. Besides, the ignition of meteorites is believed to have taken place at altitudes of more than 50 miles; and auroral arches have been observed at least 60 miles high.

TWILL, a woven fabric, in which the warp is raised one thread, and depressed two or more threads for the passage of the weft: this gives the structure a curious appearance of diagonal lines.

TYBEE′, an island and sound at the mouth of the Savannah River, Georgia, U. S. The sound is a bay of the Atlantic, extending from Tybee Island on the south to Hilton Head on the north, opening to Port Royal entrance by Cooper's River, Wall's Cut, Lazaretto Creek, and other channels. The island is six miles long by three wide; and was occupied in 1861 by General Sherman, who erected batteries for the reduction of Fort Pulaski, which capitulated April 11, 1862.

TY′BURN, previously to 1783, the chief place of execution in London, was situated near the north-eastern corner of Hyde Park, at the western extremity of Oxford Street, and at the point where the Edgeware and Uxbridge Roads unite. It took its name from a small stream which ran from Hampstead to the Thames through St James's Park, but which has long since disappeared. The gallows seems to have been a permanent erection, resting on three posts, whence the phrase, 'Tyburn's triple tree.' Wooden galleries were erected near it for the accommodation of spectators. Hogarth's Idle Apprentice was executed at Tyburn; and the print which represents the scene, gives a good idea of an execution there. The criminal was conveyed all the way from Newgate to Tyburn, a distance of about two miles, by Holborn and the Tyburn Road, now Oxford Street, but in the 17th c. a 'sloughy country road.' As Oxford Street and London generally spread westward, the long procession became inconvenient, and the place of execution was, on 9th December 1783, removed to the Old Bailey, or Newgate, where it has since remained.

In early times, the frequency of executions rendered the office of hangman more important than it has since become. Throughout the reign of Henry VIII. (38 years), the average number of persons executed in England was 2000 annually. In our own time, the corresponding number has sunk to twelve. Formerly, the hangman must have had almost daily work. This fact, taken in connection with the increase of population, and the employment of the Tyburn hangman in state executions, explains the important place he occupied in popular imagination, and the frequent mention of him in contemporary literature. The first on record was 'one Bull,' who flourished in 1593. He was succeeded by Derrick, referred to in the *Fortunes of Nigel*, and mentioned in a political broadside as living in 1647. In the ballad of *The Penitent Tailor*, published in the same year, reference is made to his successor, Gregory Brandon–

'I had been better to have lived in beggary,
Than to have fallen into the hands of Gregory.'

In Gregory's time, it became the custom to prefix 'squire' to the names of the Tyburn hangmen. This is said to have originated in a practical joke played upon the Garter King-of-arms. He was induced to certify the authenticity of a coat-of-arms of a gentleman named Gregory Brandon, who was supposed to reside in Spain, but who turned out to be the hangman. The Garter King was committed to prison for his negligence, and hence the popular error, that 'an executioner who has beheaded a state prisoner becomes an esquire.' Gregory was succeeded by his son Richard. 'Squire Dun' followed; and after him came Jack Ketch, or Squire Ketch, first mentioned in 1678. He was the executioner who beheaded Lord Russell and the Duke of Monmouth. Lord Macaulay, in speaking of the execution of the latter, says: 'He then accosted Jack Ketch, the executioner, a wretch whose name has, during a century and a half, been vulgarly given to all who have succeeded him in his odious office. "Here," said the duke, "are six guineas for you. Do not hack me, as you did my Lord Russell. I have heard that you struck him three or four times. My servant will give you some gold, if you do the work well."'—See *History of England*, vol. ii. p. 205. What followed, it is needless to repeat. After this time the 'kings of Tyburn' all received the name of Ketch, and their patronymics seem to have been less noted. Jack Ketch's immediate successor was 'one Rose, a butcher;' and the last of the Tyburn hangmen was Edward Dennis, condemned for taking part in the No-Popery Riots, but respited, it is

believed, on the ground that his services could be ill dispensed with.

Among the most memorable executions at Tyburn were those of Elizabeth Barton, the Holy Maid of Kent, and her confederates (1534); John Felton, the murderer of the Duke of Buckingham (1628); Jack Sheppard, the highwayman (1724); Jonathan Wild, the thief-catcher (1725); Mrs Brownrigg, the murderer of an apprentice (1766); Dr Dodd (q. v.), found guilty of forging a bond for £4200 (1777); and the Rev. Henry Hackman, murderer of Miss Reay (1779). The associations connected with Tyburn have naturally led to the suppression of the name in the street nomenclature of London; but it survives in that given to the quarter of the metropolis described by Mr Thackeray as 'the elegant, the prosperous, the polite Tyburnia, the most respectable district in the habitable globe.'—See Chambers's *Book of Days*, vol. ii., and *Notes and Queries*, 2d series, vol. ii.

Under a statute of William III. (10 and 11, c. 23, s. 2), prosecutors who secured a capital conviction against a criminal were exempted from all manner of parish and ward 'offices within the parish in which the felony had been committed.' Such persons obtained what was called a 'Tyburn ticket,' which was enrolled with the Clerk of the Peace, and sold like any other property. The privilege the tickets conferred must have been highly valued, as they sold at a high price. 'Last week,' says the *Stamford Mercury* of 27th March 1818, 'a Tyburn ticket sold in Manchester for £280.' The act under which they were granted was, however, repealed a few months later, by 58 Geo. III. c. 70, passed 3d June 1818; and since then they have ceased to be recognised.—See *Notes and Queries*, 2d series, vol. xi.

TYE, CHRISTOPHER, an English musician of note of the 16th century. He was born at Westminster in 1500, educated in the King's Chapel, and held the office of musical instructor to Edward VI. when Prince of Wales. He received the degree of Musical Doctor from the university of Cambridge in 1545, and from Oxford in 1548. Under Elizabeth, he was organist to the Chapel Royal, and produced various services and anthems, some of which are yet in repute among musicians. Dr T.'s general scholarship was considerable.

TYLER INSURRECTION. A poll-tax of three groats, imposed in 1381, during Richard II.'s minority, to defray the expenses of the war with France, roused the spirit of resistance among the common people. An insult offered by one of the tax-gatherers to a blacksmith's daughter in Essex, led to the first open outbreak. The populace rose everywhere, and under the conduct of two peasants, named Wat Tyler and Jack Straw, they mustered in great force at Blackheath, committing violence on all who came into their hands. They had an interview with the king, who, finding resistance vain, promised acquiescence with their demands, which included a general pardon, freedom of commerce, and the abolition of villeinage. Meantime, a party of insurgents had broken into the Tower, and murdered the Primate and Chancellor, and the Treasurer. The king, encountering Tyler at the head of the rioters in Smithfield, invited him to a conference, when he conducted himself with an insolence that led Walworth, the mayor, to despatch him with a dagger. The king immediately, with great presence of mind, offered himself to head the populace, and leading them to the fields at Islington, where a body of troops had been collected for his Majesty's protection, ordered the rioters to disperse. The revolt, however, was not extinguished without considerable bloodshed.

TYLER, JOHN, tenth President of the United States, born in Charles City county, Virginia, March 29, 1790. His father was an officer of the army in the Revolution, and a judge of the Federal Court of Admiralty. John entered William and Mary College at 12, and graduated at 17, was admitted to the bar at 19, and almost immediately entered upon a large practice. At 21, he was elected to the state legislature, supporting the policy of Jefferson, Madison, and the Democratic party. He was almost unanimously elected five times; and in 1816, entered Congress. During his long congressional career, he sustained all the measures of the State Rights party. In 1825, he was elected governor of Virginia; and in 1827, senator in Congress. He supported General Jackson and the Democratic policy; but sided with Mr Calhoun on the question of nullification. At a later period, however, 1833—1834, he supported Mr Clay's resolutions of censure on General Jackson for removing the government deposits from the United States bank. From this period, he became an active partisan of Henry Clay, the candidate of the Whig or Republican party; and in 1840, was elected Vice-president of the United States, with General Harrison as President. President Harrison died April 4, 1841, a month after his inauguration, by which event Mr T. became President. He began his administration by removing Democrats from office, and appointing Whigs, and pronouncing in favour of Whig measures, but soon after vetoed a bill for a United States bank, passed by Congress; several members of the cabinet resigned; and after some changes, John C. Calhoun, the great Southern Democratic statesman, became Secretary of State. The most important act of his administration was the annexation of Texas, March 1, 1845. At the close of his term of office, he retired to private life until 1861, when he was President of a Peace Convention at Washington. Failing in his efforts at a compromise, he gave his adhesion to the Confederate cause, and was a member of the Confederate Congress until his death, at Richmond, January 17 1862.

TYLO'PHORA, a genus of plants of the natural order *Asclepiadaceæ*, natives of the East Indies, New Holland, &c., with a wheel-shaped corolla, and a 5-leaved fleshy coronet. *T. asthmatica*, a native of the coast of Coromandel, has a high reputation as a medicinal plant. Its root possesses properties similar to those of ipecacuanha, has been found of great use in dysentery, and is esteemed one of the most valuable medicines of India.

TY'MPANUM (Lat. a drum), in Anatomy, the middle ear (see EAR). In Architecture, the flat space left within the sloping and horizontal cornices of the pediment of Classical Architecture, usually filled with sculpture (see GRECIAN ARCHITECTURE, fig. 2); also, the space between the arch and lintel of doorways in Gothic Architecture.

TYNDALL, JOHN. See SUPPLEMENT in Vol. X.

TYNE, a river in the north of England, important from the enormously valuable mineral district through which it flows, and for the flourishing towns that line its banks, is formed by the confluence of two head-waters—the North Tyne and the South Tyne. The North Tyne rises on the Scottish border, 11 miles south-east of Hawick. It flows south across Keelder Moor, and south-east to Hexham, after traversing a district abounding in picturesque villages and gentlemen's seats. Its chief affluent is the Reed, which rises on Carter Fell, and flows south-east past Otterburn to Bellingham, where it joins the larger stream. Near Hexham, the North Tyne is joined by the South

Tyne, which rises on the slopes of Cross Fell, 11 miles north of Appleby, in Westmoreland, flows north to Haltwhistle, and thence east to Hexham, through a district crowded with old castles and peel-houses. From the junction of the two head-waters, the T. flows east through the south of Northumberland, which presents charming scenery, and is studded with castles and country seats. At Blaydon—about 8 miles above Newcastle—the navigation begins, and from this point, passing Newcastle (q. v.), Gateshead (q. v.), North Shields (q. v.), and South Shields (q. v.), its banks are lined with foundries, furnaces, docks, wharfs, and quays. Total length 80 miles. For the navigation of the river, see the chief towns near its mouth.

TY'NEMOUTH, a small village and parish of Northumberland, takes its name from the river Tyne, on the south bank of which, and near its mouth, it stands. It is 8 miles east of Newcastle by railway, and its light-house is in lat. 55° 1′ N., long. 1° 25′ W. Though itself only a village, it gives name to a township containing about 25,000 inhabitants. Much of this township, however, is comprised in the town of North Shields (see SHIELDS, NORTH), and counts in the population of that town. It also gives name to a parliamentary and municipal borough, containing (1881) 43,863; but including, besides the village of T., the large town of North Shields, and the three villages of Chirton, Preston, and Cullercoats. The village of T. is much frequented as a watering-place by the inhabitants of Newcastle. Its sands, about a mile in length, form an excellent bathing-ground. There are many attractive buildings and institutions, as the castle and fortifications, the fine ruins of a priory and Lady chapel, the Master Mariners' Asylum, &c. The borough of T. sends one member to the House of Commons.

TYPE (Gr. *typos*, an impression or stamp), the name given to the stamps or dies which impress the letters on the paper in Printing (q. v.). Printers, in early times, made the letters which they used, but in process of time the necessity for a division of labour created the distinct business of *type-founding*. There is evidence that, at the beginning of the 16th c., the apparatus for type-founding was much the same as up till near the middle of this century. The first step in the process is the cutting of a punch or die resembling the required letter. The punch is of hardened steel, with the figure of the letter cut, the reverse way, upon its point. On this die being finished, it is struck into a piece of copper about an inch and a quarter long, one-eighth of an inch deep, and of a width proportionate to the size of the type to be cast. This copper, being so impressed with the representation of the letter, requires to be adjusted to the mould, so that the 'face' or impression of the punch (in the copper) may be brought into such relation with the metal which forms the 'body' or stalk of the type, that when the types are 'set up' they may stand at the proper distance from each other, and be in 'line' or range, and also square to the page; this work is termed 'justifying,' and the copper is now a 'matrix.' The matrix is now fixed into a small instrument or frame, called the mould, which is composed of two parts. The external surface is of wood, the internal of steel. At the top is a shelving orifice, into which the metal is poured. The space within is of the size of the required body of the letter, and is made exceedingly true. The melted metal, being poured into this space, sinks down to the bottom into the matrix, and instantly cooling, the mould is opened, and the type is cast out by the workman. This process of casting types is executed with great celerity. Of course, every separate letter in the alphabet, every figure, point, or mark, must have its own punch and matrix. In casting types, the founder stands at a table, and has beside him a small furnace and pot with heated metal, which he lifts with a small ladle. *Type-metal* was a compound of lead and regulus of antimony, with a small proportion of tin; but in 1856, a new compound was formed by adding a *large* proportion of tin to the lead and antimony, which considerably increased the cost of the metal, but it doubled its durability. The antimony gives hardness and sharpness of edge to the composition, while the tin gives toughness and tenacity, and removes the brittleness which antimony causes when used in a large proportion without tin. The proper proportions of these metals are regulated by the size of the type, a greater quantity of antimony being employed for small letters.

Various attempts were made during the early part of this century to cast type by machinery; but the first successful type-casting machine was invented by David Bruce, Jr., of New York, and was patented March 17, 1838.* The patent was sold to George Bruce, and the machines were used by him until 1845. David Bruce meanwhile patented another machine in 1843, which, with new improvements, patented two years later, gave entire satisfaction, and is now in general use in American foundries. This machine (in some cases with modifications) was slowly adopted by European founders. It produces more than double the quantity that the hand-mould did, while the finish and regularity of the type so cast are much more perfect.

The type-casting machine consists, first, of a small melting-pot, which contains the molten metal and is placed over a small furnace having an outer

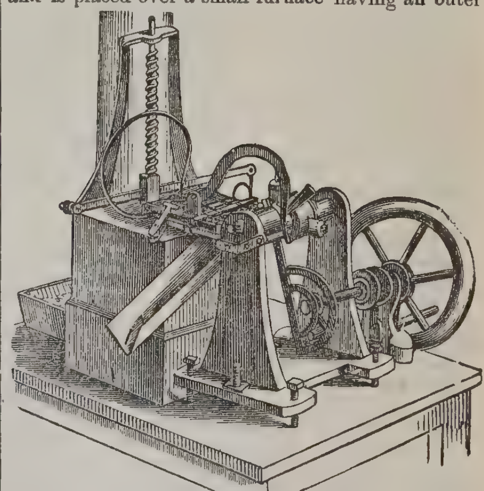


Fig. 1.—Type-casting Machine.

case of cast-iron. In the interior of the pot is arranged a forcing-pump and valve for admitting the metal under the piston, and also for preventing the return of the metal into the mass in the pot when the piston is depressed, and thus securing the full force exerted upon the piston being transmitted by the piston to the molten metal under it, and forcing it through a narrow channel leading from the bottom of the chamber in which the piston works to the outside of the pot, where a nipple is

* The first type-casting machine was patented in the United States in 1828, by William M. Johnson; but it did not produce good type.

inserted, with a small hole through it, communicating with this narrow channel. Against this nipple, the mould in which the type is formed is pressed at the moment at which the piston descends, and so receives the molten metal that forms the type.

The second part of the machine is that which carries the mould, and to which the mould is firmly bolted. The mould is similar to the old hand-mould, but modified to suit the machine; it is much stronger; the 'jets' are shorter, and the orifice by which the metal enters is smaller, so that it may be brought exactly coincident with the small hole in the nipple in front of the pot. The mould—as the old hand-mould—is made in halves; the one half being firmly bolted to an arm which, by cams and levers, is made to oscillate, and carry the mould to and from the nipple in front of, and above the pot; the other half of the mould is bolted to another arm, which, by a peculiarly formed hinge, is attached to the first arm, so that the two halves of the mould may be made to open and shut upon each other, like the lid of a snuff-box; and so both sides of the mould oscillate together to and from the nipple in the pot from which they receive the molten metal. The furnace, with the pot and machine carrying the mould, are raised upon cast-iron framing to a height convenient for a man standing to watch the working of the machine. The operation of the machine is as follows: The piston being raised in the chamber of the pump, and the chamber being supplied with metal through the valve, the mould is brought against the nipple; the valve closes, to prevent the metal being forced back into the pot; the piston descends, and forces the metal through the narrow channel into the mould; the mould then recedes from the nipple, and in receding, the two halves separate from each other, and eject the type; the mould again approaches the nipple, and in approaching, the two halves close together, and are ready for another operation.

A blast of cold air is directed upon each mould, to keep it cool.

When the type is cast from the mould, it is in a rough state; and as soon as a heap has accumulated on the caster's table, they are removed by a boy, who breaks off a superfluous tag of metal, or 'jet,' hanging at the end of each type. From the breaking-off boy the types are removed to another place, where a boy rubs or smooths their sides upon a stone. Being now well smoothed, they are next removed to a table, and set up in long lines upon a 'stick;' they are then dressed or finished, and after being examined by a magnifying glass, are ready for use. Whatever be the size of the types they are all made of a uniform height, and must be perfectly true in their angles, otherwise it would be quite impossible to lock them together. A single irregular type would derange a whole page. The height of type made in this country is $\frac{29}{32}$ds of an inch; those made in France, Spain, and Germany are higher. All the types of one class of any founder are always uniform in size and height; and to preserve their individuality, all the letters, points, &c. belonging to one class are distinguished by one or more notches or nicks on the body of the type, which range evenly when the types are set. These nicks, as we shall immediately see, are also exceedingly useful in guiding the hand of the compositor. Types are likewise all equally grooved in the bottom, to make them stand steadily.

The earliest types used were in the style known as Gothic or Black-letter; which was afterwards superseded, except in Germany, by the Roman letter. See BLACK-LETTER. The varieties of size of types in the present day amount to forty or fifty, enlarging, by a progressive scale, from the minutest used in printing pocket-Bibles, to the largest which is seen in posting-bills on the streets. Printers have a distinct name for each size of letter, and use about sixteen sizes in different descriptions of book-work; the smallest is called *Brilliant*, the next *Diamond*, and then follow in gradation upwards, *Pearl*, *Agate*, *Nonpareil*, *Minionette*, *Minion*, *Brevier* (the type with which this sheet is printed), *Bourgeois*, *Long Primer*, *Small Pica*, *Pica*, *English*, *Great Primer*, and *Double Pica*. The larger sizes generally take their names thus—*Two-line Pica*, *Two-line English*, *Four*, *Six*, *Eight*, or *Ten line Pica*, &c. Other nations designate many of these sizes by different names. Some of these names were given from the first maker; others from the books first printed with the particular letter. Thus, *Cicero* is the name of a type in France and Germany, with which Cicero's letters were first printed (Rome, 1467); *Pica* is from the service of the mass, termed *Pica* or *Pic*; *Primer*, from *Primarius*, the book of Prayers to the Virgin; *Brevier*, from *Breviary*; *Canon*, from the *canons* of the Church, &c.

All kinds of types are sold by weight by the founders, the price varying in amount according to the size of the letter. The smallest size, *Brilliant*, costs about $5 per pound; *Diamond*, $1.80 per pound; *Brevier*, about 70 cents; *English*, 56 cents; and so on in proportion for all intermediate sizes. Expensive as types thus are, their prices will not appear too high, considering the immense outlay in cutting the punches and the general manufacture. In the *Diamond* size, 3300 go to a single pound-weight of the letter *i*, and of the thinnest *space* about 5000.

A complete assortment of types is called a *Fount*, which may be regulated to any extent. Every type-founder has a scale shewing the proportional quantity of each letter required for a fount; and a peculiar scale is required for every language. For the English language, the following is a typefounder's scale for the small letters of a fount of types of a particular size and weight:

a	8500	h	6400	o	8000	v	1200
b	1600	i	8000	p	1700	w	2000
c	3000	j	400	q	500	x	400
d	4400	k	800	r	6200	y	2000
e	12,000	l	4000	s	8000	z	200
f	2500	m	3000	t	9000		
g	1700	n	8000	u	3400		

It will be seen from this scale that the letter *e* is used much more frequently than any other character.

Type-founding originated in Germany along with printing; as early as 1452, P. Schöffer (see GUTENBERG) had substituted types of cast-metal for the original wooden types. The earliest and best punch-cutters were in Nürnberg, which continued for a considerable time to supply the type-founders throughout Germany with punches. Bodoni (b. 1740, d. 1813) in Italy, the Didots (q. v.) in France, and Breitkopf (b. 1719, d. 1794) in Leipzig, are the most distinguished names in the subsequent history of type-making on the continent. The art made little progress in Great Britain from the time of Caxton, and the types used were mostly imported from Holland, until about the year 1720, when William Caslon, originally an engraver of ornamental devices, turned his attention to letter-cutting, and soon established such a reputation as not only put a stop to the importation of foreign types, but caused his own to be frequently sent to continental countries. The foundry established by Caslon in London is still in existence. Baskerville (q. v.) is the next greatest name in the history of the art in England. The types produced by Alexander Wilson of Glasgow became the foundation of the fame of the Foulis (q. v.) as printers.

The earliest type-founder in America was Christopher Saur (or Sower), who cast the type used by him in printing a German Bible in quarto, about the year 1735, in Germantown, Pa. The first regular foundry was commenced in 1796, by Binney & Ronaldson, in Philadelphia. This foundry (now conducted by Mackellar, Smiths & Jordan) is one of the most extensive in the world, and the quality of its manufactures is unsurpassed. Excellent type is also made in New York, Boston, Cincinnati, and other cities in the United States. American wood type, for posters and handbills, is so highly esteemed that it commands the market even in Great Britain.

Type-setting, or 'Composing.'—All the types used in printing-offices are sorted in cases, or shallow boxes, with divisions. There are two kinds of cases —the *upper* and *lower case;* the latter lying nearest the compositor upon the frame for their support. The annexed illustration exhibits the arrangement of the cases and position of the compositor—the lower case being immediately under his hand, the

Fig. 2.

upper case directly above in a slanting position, and the under part of the frame stocked with cases of different founts. In the upper case are placed all the capitals, small capitals, accented letters, a few of the points, and characters used as references to notes. In the lower case lie all the small letters, figures, the remainder of the points, and spaces to place betwixt the words. In the lower, no alphabetical arrangement is preserved; each letter has a larger or smaller box allotted to it, according as it is more or less frequently required; and all those letters most in request are placed at the nearest convenient distance to the compositor. By this ingenious and irregular division of the lower case, much time is saved to the compositor, who requires no label to direct him to the spot where lies the particular letter he wants. To a stranger, nothing appears so remarkable as the rapidity with which a compositor does his work; but habit very soon leads the hand rapidly and mechanically to the letter required. When *italic* letters have to be introduced, they are taken from a separate pair of cases of the same fount.

The process of composing and forming types into pages may now be adverted to. Placing the copy or manuscript before him on the upper case, and standing in front of the lower case, the compositor holds in his left hand what is termed a composing-stick. Sometimes this instrument is of wood, with a certain space cut in it of a particular width; but more commonly it is made of iron or brass, with a movable slide, which, by means of a screw, may be regulated to any width of line. In either case, the composing-stick is made perfectly true and square. One by one, the compositor lifts and puts the letters of each word and sentence, and the appropriate points, into his stick, securing each with the thumb of his left hand, and placing them side by side from left to right along the line. When he places a letter in the stick, he does not require to look whether he is placing it with the face in its proper position; his object is accomplished by looking at what is called the *nick*, which must be placed outward in his composing-stick. (See adjoining representation of a type.) This is one of those beautiful, and at the same time simple, contrivances for saving labour which experience has introduced into every art, and which are as valuable for diminishing the cost of production as the more elaborate inventions of machinery. When he arrives at the end of his line, the compositor has a task to perform in which the carefulness of the workman is greatly exhibited. The first letter and the last must be at the extremities of the line: there must be no large spaces left in some instances, and crowding in others, as we see in the best manuscript. Each metal type is of a constant thickness, as far as regards that particular size of letter; though all the letters are not of the same thickness. The adjustments, therefore, to complete the line with a word, or at any rate with a syllable, must be made by varying the thickness of the spaces between the words. A good compositor's work is distinguished by uniformity of spacing; he will not allow the words to be very close together in some instances, and with a large gap between them in others, as is evident, for instance, in this sentence. In composing poetry, or similar matter, where there is always a blank space at one of the ends of the line, spacing is very easily accomplished by filling up the blank with larger spaces, or *quadrats.* But whether prose or poetry, the matter of each line must be equally adjusted and *justified,* so as to correspond in point of compactness with the previously set lines. The process of composing is greatly facilitated by the compositor using a thin slip of brass called a *setting-rule,* which he places in the composing-stick when he begins, and which, on a line being completed, he pulls out, and places upon the front of the line so completed, in order that the types he sets may not come in contact with the types behind them, but glide smoothly into their places to the bottom of the composing-stick.

Fig. 3.

When the workman has set up as many lines as his composing-stick will conveniently hold, he lifts them out by grasping them with the fingers of each hand, and thus taking them up as if they were a solid piece of metal. He then places the mass in an elongated board, termed a *galley,* which has a ledge on one or perhaps both sides. The facility with which some compositors can lift what is called a *handful* of movable type without deranging a single letter, is very remarkable. This sort of skill can only be attained by practice; and one of the severest mortifications which the printer's apprentice has to endure, is to toil for an hour in picking up about a thousand letters, and then see the fabric destroyed by his own unskilfulness, leaving him to mourn over his heap of broken type, technically denominated *pie.*

Letter by letter, and word by word, is the composing-stick filled; and by the same progression the galley is filled by the contents of successive sticks. When the compositor has set up as many lines as fill a page, he binds them tightly round with cord, and removes them from the galley.

Sometimes, as in the case of newspaper and

similar work, the *handfuls* of type are accumulated till they fill the galley, and in that form are prepared for press. After the matter is thus far prepared, it is the duty of the pressman to take an impression or *first proof* from the types, in order that the first-proof *reader* may compare with 'copy,' or MS.; after which it is handed to the compositor, so that he may correct the errors which are sure to have been made. Proofs are usually taken by a press kept for the purpose. After the galley matter is corrected and re-corrected by the compositor, it is divided into pages of the size wanted; and head-lines or figures indicating the number of the page, being added, the pages are arranged upon a large firm table, and there securely fixed up in an iron frame or *chase*, by means of slips of wood and wedges, or *quoins*. The annexed cut is a representation of a small *form*, consisting of four pages of type.

This process, which is called *imposing*, being completed, and the face of the types being levelled by a *planer* and mallet, the *form*, as it is called, is

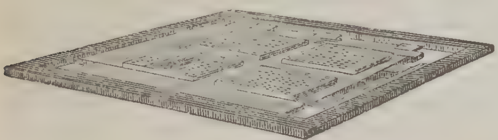


Fig. 4.

proved, and prepared for press. Proof-sheets being taken, they are subjected to the scrutiny of a *reader* employed in this peculiar function in the office, the author himself having previously given effect to his corrections or emendations. When the *reader* has pointed out words and letters to be altered or corrected, the compositor once more goes over the form, correcting the errors by lifting out the letters with a bodkin, and, when revised, the sheet is pronounced ready for printing. The imposing-table at which all these corrections are made is usually composed of smooth stone or marble or cast-iron on the top. See TYPE-SETTING MACHINES in SUPPLEMENT in Vol. X.

TYPE, in Theology, an image or representation of some object which is called the antitype. In theological use, it is applied chiefly, although not exclusively, to those prophetic prefigurings of the persons and things of the New Dispensation which are found in the ritual, and even in the history, of the Old Testament. Under the heads HERMENEUTICS, EXEGESIS, have been explained the different senses of which the literal text of Scripture is considered susceptible. Of one of these, the 'mystical,' the 'typical' sense forms a further subdivision. The word 'type' itself is used as well by the writers of the New Testament (Acts, vii. 43; Romans, v. 14; Philippians, iii. 17) as by the Jewish historians, for instance, Philo, *Opp.* t. i. p. 108; and while St Paul and other sacred writers speak of the ancient types of things to come, St Peter completes the parallelism by describing baptism as the antitype of the ark of Noah, 1 Peter, iii. 21. Of the types of the Old Testament, many are directly pointed out as such in their very institution; many also are distinctly applied in the New Testament. There is a large class, however, which more properly fall under the mystical sense of Scripture, and which are called indirect, that is to say, 'adaptive' or 'applied' types. In the application and interpretation of these, many of the Fathers, and especially Augustine and Gregory the Great, are most elaborate and ingenious.

TYPES, CHEMICAL. The idea of referring organic bodies to some simple type or representative has attracted the attention of many chemists, amongst whom Dumas, Sterry Hunt, Laurent, and Gerhardt especially deserve notice. As our limited space prevents us from attempting to trace out the history of the theory, we shall confine ourselves to a statement of the outline of the doctrine, as now adopted in most recent books on organic chemistry. Hydrochloric acid, water, ammonia, and marsh gas have been shewn to be compounds, each of which may be taken as a representative of a whole class of bodies. The four principal types to which all chemical compounds are now referred are, therefore, (1) the hydrogen, HH, or hydrochloric acid type, HCl; (2) the water type, H_2O; (3) the ammonia type, H_3N, and (4) the marsh gas type, H_4C.

In all the formula here used, the atomic weight of oxygen is taken at 16, sixteen parts of oxygen being the smallest quantity which unites with two atoms of hydrogen to form water, and nearly all oxidised compounds must necessarily be represented with 16 or some multiple of 16 parts of oxygen. Carbon is represented by its equivalent number 12.

1. The hydrogen, or hydrochloric acid type, $\left.\begin{array}{l}H\\Cl\end{array}\right\}$, includes the chlorides, hydrides, haloid salts, metallic hydrides, metals proper and alloys, halogen ethers, metallic compounds of alcohol radicles, acid chlorides, aldehydes, and acetones. Examples may be found in chloride of potassium KCl, chloride of ethyl $(C_2H_5)Cl$, potassium ethyl, $K(C_2H_5)$, acetic aldehyde $(C_2H_3O)H$, &c.

2. The water type, $\left.\begin{array}{l}H\\H\end{array}\right\}O$, includes the oxides, sulphides, selenides, &c., whether basic, alcoholic, intermediate, or acid. The following are examples: methyl alcohol, $CH_4O = \left.\begin{array}{l}CH_3\\H\end{array}\right\}O$; ethyl alcohol, or common alcohol, $C_2H_6O = \left.\begin{array}{l}C_2H_5\\H\end{array}\right\}O$; acetic acid, $C_2H_4O_2 = \left.\begin{array}{l}C_2H_3O\\H\end{array}\right\}O$; acetate of potash, $C_2H_3O_2K = \left.\begin{array}{l}C_2H_3O\\K\end{array}\right\}O$; acetic ether, or acetate of ethyl, $C_4H_8O_2 = \left.\begin{array}{l}C_2H_3O\\C_2H_5\end{array}\right\}O$; common ether, or oxide of ethyl, $C_4H_{10}O = \left.\begin{array}{l}C_2H_5\\C_2H_5\end{array}\right\}O$, &c.

3. The ammonia type, H_3N, or $\left.\begin{array}{l}H\\H\\H\end{array}\right\}N$, includes the amines and amides, the nitrides, phosphides, arsenides, whether alcoholic, intermediate, or acid. For example: amide of potassium, $KH_2N = \left.\begin{array}{l}K\\H\\H\end{array}\right\}N$, or as it may be written, K.H.H.N; nitride of potassium, $K_3N = \left.\begin{array}{l}K\\K\\K\end{array}\right\}N$; ethylamine, $(C_2H_5)H_2N = \left.\begin{array}{l}C_2H_5\\H\\H\end{array}\right\}N$, and dibenzol sulpho-phenylamide, $(C_7H_5O)_2(C_6H_5SO_2)N = \left.\begin{array}{l}C_7H_5O\\C_7H_5O\\C_6H_5SO_2\end{array}\right\}N$.

4. The marsh gas type, H_4C, $\left.\begin{array}{l}H\\H\\H\\H\end{array}\right\}C$, includes a numerous class of compounds which are produced by replacement of more or less hydrogen of the marsh gas, which is the normal hydride of carbon. Thus, chloride of methyl, CH_3Cl, is monochlorinated marsh gas, $\left.\begin{array}{l}Cl\\H\\H\\H\end{array}\right\}C$; methyl-alcohol is marsh gas wherein hydro-

gen has been replaced by peroxide of hydrogen, $\left.\begin{matrix}HO\\H\\H\\H\end{matrix}\right\}C$; formic acid is marsh gas wherein some of the hydrogen has been replaced by oxygen, and some by peroxide of hydrogen; thus, $\left.\begin{matrix}O_2\\HO\\H\end{matrix}\right\}C$.

To the above may be added the multiple and mixed types, formed by combining two or more together; sometimes, however, it is convenient to refer compounds to types containing radicles of higher atomicity; for example, pentachloride of phosphorus, PCl_5, may be referred to a type, HHHHHP; or chloride of tungsten, WCl_6, to that of HHHHHHW.

In classifying the elements, those which combine by volume, in the proportion of 1 to 1, are termed *monatomic*, and all others, *polyatomic*. The union of two or more molecules of the same or different types by the substitution of polyatomic elements or radicles for an equivalent number of hydrogen atoms gives considerable extension to the power of typical representation.

The same compound may be referred to different types; thus, trichloride of phosphorus, PCl_3, may be derived from a triple molecule of hydrochloric acid, $3HCl$, by substitution of P''' for H_3; or from ammonia, NH_3, by substitution of P for N, and Cl_3 for H_3.

All chemical compounds may be regarded as aggregations of ideal hydrogen-molecules, held together by the introduction of one or more polyatomic elements or radicles. The several types are not classes of compounds distinctly separated from one another by differences of constitution, but rather movable groups, in which compounds may be placed together according to the particular analogies which it is desired to bring to light.—See Graham's *Elements of Chemistry;* articles *Classification* and *Types*, in Watts's *Dictionary of Chemistry;* also *Smithsonian Report*, 1863.

TY'PHA, a genus of plants, belonging to the natural order *Typhaceæ* of some botanists, which, according to others, is a sub-order of *Araceæ*. The *Typhaceæ* all inhabit marshes or ditches. They have nodeless stems, unisexual flowers arranged on a spadix, without a spathe, the spadix of the male flowers being situated at the summit of the stem, above that of the female flowers, the perianth consisting of scales or lax hairs, the anthers on long filaments, the fruit dry, consisting of the seed with adherent pericarp. They are found in very different climates, and scattered over the world. Two species of T. are found in North America, *T. latifolia* and *T. angustifolia*, and are popularly known as CAT'S-TAIL or REED-MACE. *T. latifolia* is not so common as the former, and is known as the SMALL CAT-TAIL. It grows to the height of five or six feet. The root-stocks are astringent and diuretic, and abound in starch. The young shoots both of this and *T. angustifolia* are much eaten by the Cossacks of the Don; and are sometimes used in England under the name of *Cossack Asparagus*. The pollen of T. is inflammable, like that of *Lycopodium*, and is used as a substitute for it. *T. angustifolia* and *T. elephantina* are employed in India for making mats and baskets.

TYPH-FEVER is a term which is now coming into use to designate continued low fever. The best-marked varieties of this affection are known as typhus and typhoid fevers, which in typical cases are easily distinguished from one another, but not unfrequently so merge into one another that it is difficult to decide whether the disease should be classed as typhus or typhoid fever; and hence the general term typh-fever is a very convenient one in doubtful cases. All the typh-fevers belong nosologically to the miasmatous order of zymotic diseases.

TY'PHON, in Egyptian Mythology, was the Greek name of a son of Seb (Kronos) and Nut (Rhea). The latter gave birth to five children on the last five days of the year; first, Osiris and Haroeris, then T., and lastly Isis and Nephthys. The Egyptian name of T. was Set, also Suti and Sutech, and in the earliest times he was a highly venerated god. He often appears on the monuments in the form of a beast, the cunning crocodile, the dreaded hippopotamus, or the obstinate ass, and with yellow hair and long blunted ears. From him the kings of the 19th dynasty, Seti (Sethos, Sethosis, changed by Herodotus into Sesostris), derive their name. The city of Ombos was a special seat of his worship. In later times, however, either about the close of the 21st dynasty or afterwards, his worship was abandoned, and his figure and name were obliterated from many of the monuments. The cause of this curious religious revolution is unknown, but at any rate, T. came to be regarded as a god hostile to the Egyptians, and was gradually developed into a personification of the principle of Evil—in short, the Egyptian Devil, the opponent of holy doctrine, and adversary of Osiris—the god of the waste howling wilderness, of the salt lakes, of drought, and of scorching heat.

The connection between the Egyptian *Set* and the Greek T. is not very easy to trace, but it undoubtedly existed. According to Homer, T. (called also Typhāon) was a huge giant, chained under the earth in the country of the Arimoi, and lashed by the lightnings of Zeus. Hesiod makes him a son of Typhōeus and a hurricane, and, by the snake-goddess, Echidna, the father of the Chimæra, the many-headed dog Orthus, the hundred-headed dragon that guarded the apples of the Hesperides, the Colchian Dragon, the Sphinx, Cerberus, Scylla, Gorgon, the Lernæan Hydra, the Eagle that consumed the liver of Prometheus, and the Nemean Lion. Typhōeus, again, was the youngest son of Tartarus (Hell) and Gæa (Earth), or, as others say, of Hera (Juno) alone. At a later period, the father and son coalesced into one person. Pindar describes T. as a monster with a hundred dragon-heads, fiery eyes, a black tongue, and a terrible voice. He sought to wrest the sovereignty of the world from Zeus, but after a fearful struggle, he was subdued by a thunderbolt from Olympus, and hurled into Tartarus, or buried under Ætna. The later poets modify the older myth with fabulous additions of their own. They connect T. with Egypt—a proof, perhaps, that he had come to be identified with the Egyptian *Set*. According to Ovid and others, all the gods fled before him into Egypt, and through fear, changed themselves into animals, excepting Zeus and Athene. After an appalling struggle, in the course of which Zeus was once hamstrung, and carried off by the daring monster, T. was vanquished, but not before he had hurled all Mount Hæmus against his adversary, in a paroxysm of supernatural rage. It is very possible that the fierce *physical* opposition of T. (especially when the monster came to be identified with *Set*, the Egyptian Devil) may have had (along with other causes) a material influence in determining that popular conception of 'Satan' which reigned both in patristic and medieval times, and of which Milton has so largely availed himself in his *Paradise Lost*.

TYPHOO'NS (Chinese *Tei-fun*, i. e. 'hot wind;' the word, it need scarcely be said, has no connection

with the Typhon of mythology) are violent storms which blow on the coast of Tonquin and China as far north as Ningpo and the south-east coasts of Japan. Varenius, in his *Geographia Naturalis*, describes them as 'storms which rage with such intensity and fury that those who have never seen them can form no conception of them; you would say that heaven and earth wished to return to their original chaos.' They occur from May to November; but it is during the months of July, August, and September that they are most frequent. They resemble the storms of Western Europe (see STORMS) in their general characteristics, with this difference, that the main features are more strongly marked. There is a depression of the barometer, over a space more or less circular in form, accompanying the typhoon, but it is generally more contracted in area, and deeper and more abrupt than in European storms. It is not uncommon for the barometer, at the centre of the depression, to read 28·3 inches, and on rarer occasions to fall even as low as 27 inches; and the changes of pressure are very rapid, frequently ·2 or ·3 inch in an hour. It is this enormous difference of atmospheric pressure between neighbouring places, and the consequent rapidity of the fluctuation, which give to these storms their terribly destructive energy—the law regulating the strength of the wind being, that it is proportioned to the difference of pressure between the place from which it comes and the place toward which it blows. The low pressure in the centre is confined to a very limited space, and since all round this space the pressure is greater, it follows that the level of the sea there will be higher. Hence, a high wave is frequently found to accompany these storms, advancing inland, carrying with it ruin and dismay, and not unfrequently bearing ships far over the level fields, where they are left stranded a considerable distance from the sea.

Typhoons have their origin in the ocean to the east of China, especially about Formosa, Luzon, and the islands immediately to the south. They thence proceed, in four cases out of five, from east-north-east toward west-south-west, more rarely from east-south-east to west-north-west, and scarcely ever from north to south, or from south to north; in other words, their course is generally along the coast of China. The body of the storm advances at the rate of 12 miles an hour and upwards, within which the winds blow often from 80 to 100 miles an hour, whirling round the centre of atmospheric depression in a direction contrary to the motion of the hands of a watch, as all storms in the northern hemisphere do. They thus rotate in the direction south, east, north, west; and travel along the coast, so that the coast feels the northern side of the storm, while at a distance from the coast the southern side is alone experienced. The south-west Monsoons (q. v.) prevail in summer over Southern Asia, to the eastward of which are the north-east trade-winds. See WINDS. Here, then, are two great aërial currents flowing contiguously, *but in opposite directions*, each highly charged with moisture, especially the south-west current, which they have taken up from the oceans they have traversed. It is highly probable that the typhoons take their origin from these opposing currents, as whirlpools do at the meeting of two sea-currents; and their intensity is aggravated by the large quantity of heat disengaged in the condensation of the vapour of the atmosphere into the deluges of rain which fall during the storm—10 and 12 inches of rain frequently falling in one day. Much yet remains to be done towards the examination and explanation of this remarkable class of storms, the first and essential step being the establishment of meteorological stations on the Chinese coast, in Japan, in Formoso, and in Luzon.

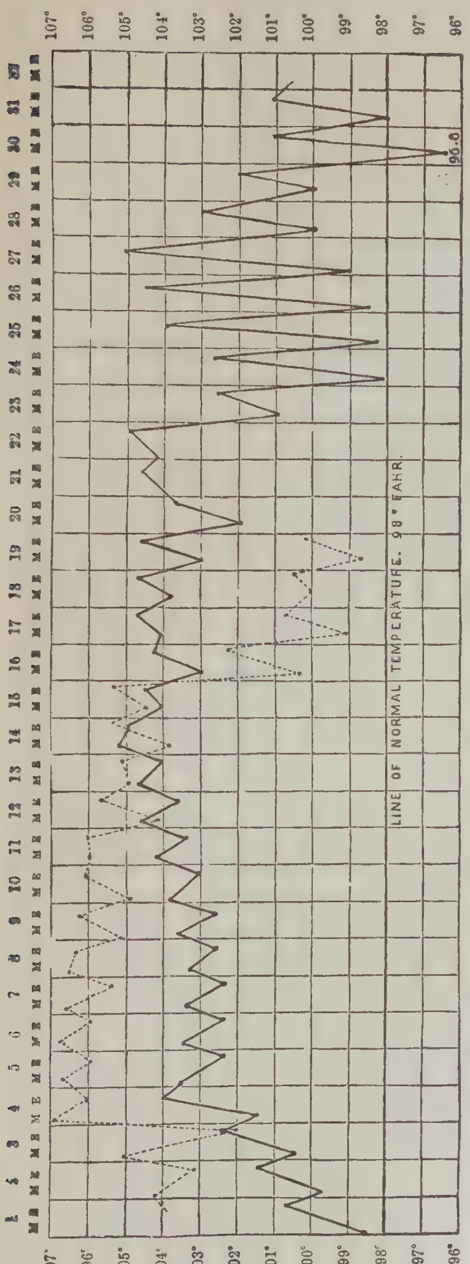
TY'PHUS AND TY'PHOID FEVERS have so much in common, that, to avoid repetition, we shall discuss them in one article. Until comparatively few years ago, it was generally believed that no definite distinctions could be drawn between the various forms of continued low fever met with in this country. In 1840, Dr A. P. Stewart, lately one of the physicians to the Middlesex Hospital, pointed out the differences which are now almost universally recognised between typhus and typhoid fevers; but his views received little attention till 1848—1850, when Dr Jenner, now Physician to her Majesty, published two papers on *The Identity or Non-identity of Typhus and Typhoid Fevers*, and on *Diseases commonly confounded under the term Continued Fevers*. In these memoirs, Dr Jenner shews, by evidence which must be satisfactory to every unbiassed mind, that typhus and typhoid fevers differ, as Dr Watson observes, 'notably and constantly in their symptoms and course, in their duration, in their comparative fatality, in the superficial markings which respectively belong to them, and which warrant our classing them amongst the exanthemata, in the internal organic changes with which they are severally attended, and (what is the most important and the most conclusive) in their exciting causes.'—*Lectures on the Principles and Practice of Medicine*, 4th ed., 1857, vol. ii. p. 795. In addition to typhus and typhoid, there is a third well-marked variety of continued fever, known as *Relapsing Fever*, which has been considered in a special article.

Typhus Fever sometimes commences to shew itself by certain premonitory symptoms, due to the depressing action of the poison—which, as will presently be seen, is the cause of the disease—upon the nervous system before it begins to affect the circulation. The patient, in these cases, is listless, unwilling to make any bodily or mental exertion, loses his appetite, feels wandering pains over the body, is drowsy during the day, and restless at night. More commonly, however, the disease begins suddenly, a shivering fit being the first symptom. Severe headache, especially across the forehead, is another common early symptom. The muscular power rapidly becomes enfeebled, and the patient very soon feels compelled to take to his bed. As in typical cases of the disease, there are three sets of symptoms, each of which occupies about a week, it is convenient to divide the description of continued (or typh) fever into that of three weekly stages. In the first week, in addition to the symptoms already noticed, the heat of the skin becomes increased, and the pulse, which at first is hard, becomes soft and weak, and more frequent than in health, often now rising to 120, and in severe cases reaching 130 or 140 beats in a minute. According to Dr Jenner, the pulse in uncomplicated *typhus* gradually rises to a maximum, preserves that rate for a variable time, and then slowly falls; while in *typhoid* it rises and falls irregularly. There is considerable thirst; the tongue becomes clammy and dry, and its centre is covered with a white fur, which is often mesially divided by a straight brown streak, which is the first step to the blackness of that organ which afterwards ensues. The intelligence is blunted; but on being sharply spoken to the patient still gives rational answers. As the week advances, the strength is so reduced, that he lies on his back, and is unable to turn about in bed without assistance. In the second week, the pulse becomes more frequent, weaker, and more compressible, and the tongue grows drier and browner. The teeth and lips are invested with dark sordes, consisting of morbid epithelium that had been shed;

and the weakness is now so extreme, that the patient sinks down in his bed. His voice becomes very feeble, and in bad cases he cannot swallow, nor can he put out his tongue. The two most remarkable symptoms of the second week are the delirium which seems to replace the headache, and about the ninth day ensues, and the appearance of the characteristic eruption. The delirium usually appears on the patient's awakening from sleep. He is inattentive to all that goes on around him, and usually lies still, muttering disjointed sentences, like a man talking in his dreams. Sometimes, however, he is more actively delirious, talking loudly and trying to leave his bed. He may sometimes be roused by a strange voice, but soon relapses into his previous state. The senses are in a disturbed condition, the patient being commonly deaf, and, in advanced cases, often suffering from *Muscæ Volitantes* (q. v.), which gives rise to attempts to grasp these visionary objects, or to pick them from the bedclothes. This symptom, which is known in medical language under the name of *Floccitatio*, is almost certainly indicative of a fatal result. The characteristic eruption, which Dr Jenner calls the *mulberry rash*, may shew itself as early as the fifth day, but most commonly appears at the beginning of the second week, and sometimes a little later. The characters of the rash vary with its age. It consists of very slightly elevated spots of a dusky-pink colour. Each spot is flattened on its surface, irregular in outline, with no well-defined margin, but fades insensibly into the hue of the surrounding skin, disappears completely on pressure, and varies in size from a point to three or four lines in diameter. In two or three days, these spots undergo a marked change. They no longer remain elevated above the surrounding cuticle; their hue becomes darker and more dingy than at first, and they now only fade on pressure, instead of completely disappearing. From this state they commonly grow paler, pass into faintly marked reddish-brown stains, and finally disappear. The spots composing this mulberry rash are generally very numerous, close together, and occasionally almost covering the skin. Sometimes, however, they are very few in number, situated at some distance from one another, and not to be distinguished at first from the *rose-spots* which, as will be presently seen, occur in typhoid fever. The mulberry rash is usually situated on the trunk and extremities, but is occasionally limited to the trunk, and in rare cases is seen on the face. No fresh spots appear after the third day of the eruption, and the rash subsides between the fourteenth and twenty-first days. The mulberry rash, though characteristic of typhus when it occurs, is not an essential symptom of the disease. Dr Jenner states, that in patients less than 15 years old, in whom the mortality is not more than 2 or 3 per cent., it is mostly either absent, or pale in hue and scanty in quantity; while in persons upwards of 50 years of age, in whom the mortality is about 56 per cent., the rash is always present, and usually dark and abundant. Hence, as in the case of small-pox, the degrees of development of the eruption may be taken as a direct measure of the intensity of the disease. It is in the course of this second week that death is most apt to occur. Amongst 25 fatal cases noted by Jenner, nine deaths only occurred after the 15th day, and not one after the 20th. If the case is going to terminate fatally, symptoms commonly and expressively termed *putrid*, set in; a peculiar fœtor is exhaled from the breath and the surface of the body; the tongue is dry, black, and fissured; the teeth are covered with dark sordes, and sloughing bed-sores occur. The prostration increases to the last degree, and *subsultus tendinum*, or involuntary twitchings of the muscles of the face and arms, make their appearance. In some cases, the ordinary stupor is replaced a day or two before death by the condition known as *coma vigil.* In this condition the patient never sleeps, but lies on his back, with the eyelids widely separated, the eyes staring and fixed in vacuity, the mouth partially open, and the face pale and devoid of expression. He is totally incapable of being roused to give a sign of consciousness, the pulse and breathing are hardly perceptible, and the skin is cool. The occurrence of death is only marked by the eye losing its slight lustre, and the chest ceasing its slow and feeble movements. During the third week, the symptoms gradually abate in those cases which are going to end in recovery. The patient often falls into a profound, quiet, and prolonged sleep between the 14th and 17th day, from which he awakes with a decided general improvement. The complexion is clearer, the delirium has disappeared, the pulse has fallen, and the tongue begins to shew signs of moisture at the edges. In a few days the tongue gradually becomes clean, the appetite becomes ravenous, and from that time the patient rapidly gains strength. In many cases, the amendment is so gradual, that it is impossible to say when it begins; and occasionally the favourable crisis is preceded by a temporary aggravation of the symptoms. A profuse sweat sometimes accompanies the favourable change. In the cases that terminate fatally, there is no rallying from the symptoms described as occurring in the second week.

The fact that the difference between typhus and typhoid fevers was first recognised only a few years ago, affords sufficient evidence that the symptoms of these diseases must be very similar. In describing *Typhoid Fever* it will consequently be sufficient if we indicate the leading points in which it differs from typhus. Amongst the earlier symptoms (although they are sometimes postponed to the end of the first week), the most characteristic are abdominal pains and diarrhœa. These are due to an ulcerated condition of the intestines, which will be presently noticed. The diarrhœa is either spontaneous, or continues after the operation of a purgative. The stools are loose and frequent; and either of a dark colour and fœtid, or of a yellow pea-soup-like appearance. The abdomen is found on examination to be unnaturally hard and resisting, tympanitic, and sometimes much distended; its shape, as Dr Jenner was the first to remark, 'is invariably the same, and somewhat peculiar. Its convexity is from side to side, and not from above downwards. The patient is never pot-bellied, but tub-shaped; the cause probably being that the flatus occupies the colon, ascending, descending, and transverse.' Pressure over the region of the cæcum frequently excites uneasiness, and usually gives rise to a peculiar gurgling movement, which is both audible and palpable, and doubtless arises from the intermixture of liquid and gaseous matters in the bowels. This gurgling is a still more common symptom at a more advanced stage of the disease, and is of the greater importance since it is rarely met with in typhus or any other disorder. An eruption usually appears at from the 8th to the 12th day of the disease. This typhoid rash is very different from that occurring in typhus; it consists of slightly elevated papulæ or pimples, with their heads rounded, and their bases gradually passing into the level of the surrounding cuticle. These papulæ are circular, and of a bright rose colour, which fades insensibly into the hue of the surrounding skin. Throughout their whole course, they disappear completely on pressure, and reappear when the pressure is removed. Each papula lasts three

or four days, and fresh ones make their appearance every day or two after their first eruption. The number present at a time is usually from six to twenty, but the limits may range from 1 to more han 100. Their average size is a line in diameter,



and they chiefly occur on the abdomen, chest, and back. As a general rule, no fresh spots occur after the 30th day. The diarrhœa, to which reference has already been made, continues with the progress of the disease, the patient often having from three to six evacuations daily, and often unconsciously passing them in bed. This persistence of the diarrhœa is one of the results of ulceration of the bowels. Another result of this ulceration is the occurrence of hæmorrhage from the bowels, which is one of the most alarming of the symptoms of typhoid fever. It occurs most frequently during the third and fourth weeks, and varies from a mere stain to a large amount. Sometimes the blood thus poured out by the ulceration of the mesenteric veins is retained in the bowel, and is only discovered after death; the clots being unable to pass through the valve of the cæcum. This hæmorrhage is always an extremely bad symptom, and may either cause immediate death by fainting, or may so weaken the patient as to cause him to succumb to the disease.

The ranges of temperature in typhoid and typhus fever differ very considerably, and although the range in a mild case of either of these diseases differs considerably from the range in severe cases, the foregoing diagram, copied by Dr Aitken from Wunderlich and Traubeo, shews the typical ranges of temperature in these diseases contrasted throughout their course, from the beginning to the end of the disease. The records indicate morning (M) and evening (E) observations. The *dotted lines* indicate the *Typhus* range, and the *continuous dark lines* indicate the range in *Typhoid*. This diagram is so plain as to require no explanatory details. It is worth while, however, to direct the reader's attention to the rapid changes which in typhoid occur on and after the 22d day, and in typhus about the 15th day. With regard to the duration of the two diseases, Dr Jenner found that the average duration of *fatal* cases of typhoid was 22 days, and of typhus 14 days; the former disease may terminate *favourably* during the fourth week, and the latter from the 13th to the 17th day.

In cases of recovery from typhoid, a remarkable fatuity remains for a considerable time; a childishness of mind often remaining for more than a month after apparent restoration to health. 'The patient,' says Dr Aitken, 'generally wakes up, as it were, from the fever, a complete imbecile. The whole man is changed. He seems to have renewed his youth. Childhood and infancy return, and the greatest care is necessary to prevent untoward events. *No man can be considered as fit for work or for general military service for three or four months after an attack of severe typhoid fever.'—The Science and Practice of Medicine*, 3d ed., vol. i. p. 382.

Typhoid fever is essentially a disease of childhood and adolescence, the average age at which it occurs being $21\frac{1}{4}$ years, and it being very rarely that a person aged more than 50 is attacked; while typhus attacks persons of all ages, from early infancy to extreme old age.

The appearances presented on the examination of the body after death are very different in these diseases. While in *typhus* the most common morbid appearances are a fluid condition of the blood; hyperæmia of the cerebral membranes, and increase of inter-cranial fluid; bronchial catarrh and pulmonary congestion, especially at the posterior part of the lungs, which are more or less collapsed; softening of the heart, liver, and spleen, and enlargement of the kidneys: in *typhoid*, there is one constant and characteristic lesion, viz., a morbid condition of the agminated glands (or glands of Peyer) and solitary glands of the small intestine, and especially of the former. These morbid changes may be briefly summed up as follows: thickening, redness, tumefaction, and finally ulceration or sloughing of the glands, the ulceration always occurring in the lower third of the small intestine. On the assumption that the natural office of Peyer's glands is, as Dr Carpenter suggests, to separate noxious

matters from the blood, and to discharge them into the intestinal canal, Dr C. J. B. Williams suggests that the ulceration so constantly met with in typhoid fever may result from the continued operation of the poison of that disease, thus escaping. When these changes proceed as far as ulceration, the case is one of extreme danger, although death does not necessarily ensue, because the scars left by healed ulcers are often seen when patients, who have had typhoid fever, have subsequently died from some other disease. The existence of these ulcers is, however, likely to prolong the illness after the fever itself has ended; to protract convalescence, and to hinder recovery; and to endanger life, even in cases of apparent convalescence, by causing hæmorrhage or perforation of the bowel. This perforation, which gives rise to intense peritonitis, occurs in about one in five fatal cases, and generally takes place through the ileum near the valve.

We now proceed to notice the origin and mode of propagation of these two diseases, beginning with *typhus*. There is undoubted evidence that all the forms of continued fever are contagious, and it may now be regarded as an established fact, from the investigations of Dr Jenner, that one species of fever cannot generate another, but that each is produced solely by its like; that typhus, for example, always propagates typhus, and never any other form of fever, as typhoid or relapsing fever. Some persons may, by some peculiarity of constitution, be able to resist the action of the poison, while others are peculiarly susceptible to it. An attack of fever generally exerts a certain amount of protective power against another attack of the same kind of fever; and *habit* has a good deal of power in fortifying the system against contagion, just as confirmed drunkards or opium-eaters can with impunity swallow doses of their respective poisons which would prove highly dangerous to a novice. 'Upon this principle,' says Dr Watson, 'has been explained the comparative immunity from contagious diseases, under like circumstances of exposure, of medical practitioners and nurses; of the keepers of filthy lodging-houses, while the new-coming inmates suffer; and even of prisoners, who, without having had the disease themselves, may nevertheless carry forth and communicate the infection, as is said to have happened at the celebrated "black assizes" at Oxford, and again at the Old Bailey in the year 1750.'—*Lectures on the Principles and Practice of Physic*, 4th ed., vol. ii. p. 829. Whether typhus can be generated *de novo* by great over-crowding and vitiation of air, by the organic impurities emanating from the respiratory and other functions, is still a disputed question. The conditions essential to its propagation are (1) overcrowding, combined with deficient ventilation; (2) personal filth, and clothes saturated with cutaneous exhalations; and (3) an impaired condition of the system, such as may result from insufficient food, scurvy, and any other debilitating causes. The patient is most dangerous as a focus of infection after the end of the first week to the period of convalescence, the peculiar odour from the skin and lungs being then the strongest. If the poison be very concentrated, the disease may be caught by exposure to it for only a few minutes. Frequently, the infected person is conscious when the poison is taken in. Dr Banks of Dublin, in an excellent lecture which he delivered on 24th April 1866, in the theatre of the Richmond Hospital, 'On the Origin and Classification of Fevers,' states that this happened in his own case, while examining the chest of a person labouring under the disease. 'The patient,' he observes, 'was seized with cough, and I was so placed that I must have inhaled his breath. The odour was peculiar and intolerably offensive. I was certain that I had imbibed the poison; and after a latent period of three days, I exhibited the usual train of symptoms which usher in typhus of the severest form.' The most common latent period is nine days.

From the investigations of various physicians, amongst whom Dr William Budd deserves especial notice, it appears that the living human body is the soil in which the specific poison of *typhoid* fever breeds and multiplies. The origin of the disease is unknown, but the poison is communicated or contained in the diarrhœal discharges which issue from the diseased intestine. These discharges, as they dry up, preserve the germs of the disease; and if through atmospheric or other agencies, these germs enter the living body, they communicate the disease, and diarrhœa soon commences. As the evacuations contain the specific virus of typhoid fever, the disease may be propagated amongst healthy persons (1) by percolation through the soil into the wells which supply drinking-water; (2) or by issuing, through defects in the sewers, into the air which is inspired; or (3) by exhalation through the apertures of small ill-trapped water-closets or privies, which are at once the receptacles of the discharges from the sick, and the daily resort of the healthy. The atmosphere thus infected with the poison is far more dangerous than that immediately surrounding a fever-patient.

For a knowledge of the means of checking the spread of typhoid fever, society is deeply indebted to Dr Budd's researches; and provided these means are thoroughly and efficiently carried out, it is believed by many of the most eminent physicians that the recurrence of this disease might be entirely prevented. In order to judge of the extent of the infection to be destroyed, there are two points to be considered—viz., *first*, the amount and duration of the intestinal discharge in each case; and *secondly*, the number of cases actually occurring. With regard to the first point, the diarrhœa lasts on an average fifteen days. With regard to the second point, the Reports of the Registrar-general shew that at least 100,000 to 150,000 cases of typhoid fever occur annually in England alone; or, in Dr Budd's emphatic words, 'every year in England, more than 100,000 human intestines, diseased in the way already described, continue each, for the space of a fortnight or thereabouts, to discharge upon the ground floods of liquid charged with matters on which the specific poison of a communicable disease has set its most specific mark.' He suggests the following details of procedure, which should be invariably attended to as soon as this disease appears: 1. All discharges from the fever-patient should be received, on their issue from the body, into vessels containing a concentrated solution of chloride of zinc. 2. Two ounces of a caustic solution of chloride of zinc should be put in the night-stool on each occasion before it is used by the fever-patient. 3. All tainted bed or body linen should immediately on its removal be placed in water strongly impregnated with the same agent. 4. The water-closet should be flooded several times a day with a strong solution of chloride of zinc; and some chloride of lime should also be placed there, to serve as a source of chlorine in the gaseous form. 5. So long as fever lasts, the water-closet should be used exclusively as a receptacle for the discharges from the sick. For further details as to the various precautions to be taken with a view of checking the spread of this and other epidemic diseases, the reader is referred to Mr Simon's 'General Memorandum,' published (in 1860) in his *Third Report on the Public Health in England*.

Although typhoid is contagious, Dr Jenner holds that it is 'infinitely less so than typhus.' Hence

in typhus a large room should, if possible, be selected for the patient, and the air should be kept fresh by having a window or a door, or both, open. Curtains, carpets, and all superfluous furniture should be removed, and the body of the patient should be kept as clean as possible by ablution, and his sheets and night-shirt frequently changed; the latter being at once plunged into water containing chloride of zinc. As the susceptibility to the disease diminishes with the advance of life middle-aged attendants should be selected; and all who approach the sick-bed should avoid as far as possible inhaling the patient's breath or the emanations from his skin. Friends occasionally visiting the patient should do so after a meal and a glass of wine or ale. When typhus patients are received into the general wards of a hospital, they should be scantily distributed amongst the general patients. It is still an open point whether such a distribution or a localisation of all the fever-cases into a special fever-ward or fever-hospital is the most advisable.

From a most careful critical study of the history of fever generally, including chemical and microscopical examination of the excretions, Dr Parkes arrives at the conclusion, that the *general treatment of fever*, including typhus and typhoid fevers, may be summed up 'as being a combination of measures to *reduce excessive heat, to insure proper excretion*, and *to act on the semi-paralysed nerves*.' The special indications for the treatment of *typhus* are: 1. To neutralise the poison, and to correct the morbid state of the blood. Hydrochloric acid is strongly recommended for this purpose; it may be given to the extent of a fluid ounce of the dilúte acid daily, mixed with a quart of barley-water sweetened with syrup of ginger, and flavoured with lemon-peel. 2. To eliminate the poison and the products of the destructive metamorphosis of tissue. For this purpose, alkaline salts may be prescribed to act on the kidneys and skin, and purgatives are often useful. 3. To reduce the temperature. 4. To sustain the vital powers, and to obviate the tendency to death: nourishment in the form of milk and water, coffee, broth, beef-tea, &c., must be administered at least once in every three or four hours, after the fourth day of fever, and alcoholic stimulants are usually serviceable about the seventh or eighth day. Great discrimination is required in prescribing them, and we are mainly indebted to the Dublin school—to Graves and Stokes—for pointing out the importance of the cardiac and radial pulses as guides for the use of alcohol in fevers. When the cardiac impulse becomes weak, and when the first sound of the heart is impaired or absent, stimulants should be freely given; and an irregular, intermitting, abnormally slow, or imperceptible pulse affords a similar indication. 5. To relieve the distressing symptoms, such as the headache, sleeplessness, and delirium; and 6. To avert and subdue local complications.

In *typhoid fever*, the chief indications of treatment are (1) to reduce the temperature, and subdue any vascular excitement that is present in excess; (2) to restrain excessive diarrhœa, for which purpose milk and lime-water in equal parts may be taken as a drink. The discharge ought not to be altogether checked, and Professor Gairdner prefers giving saline laxatives to astringents, and at the same time recommends that the lower bowel should be unloaded by warm-water injections, to which a little assafœtida or aniseed is added. In cases in which it is doubtful whether to check or encourage diarrhœa, the physician will generally be on the safer side if he discourages the action of the bowels. (3) To stimulate the nervous system by proper food, and possibly by stimulants; (4) to maintain the free action of the kidneys, which is best effected by the administration of small doses of the alkaline carbonates or of cream of tartar; (5) to influence the elimination of morbid matter from the affected intestinal glands. For this purpose, 1 or 2 grains of calomel should be given twice a day till about the tenth day, but not later. Special symptoms, such as great inflation of the abdomen (known as meteorism), hæmorrhage from the intestines, &c., must be treated by the ordinary rules. Probably the best single remedy for this form of hæmorrhage is oil of turpentine in doses of from 5 to 20 drops every hour or two. It is best administered in the form of an emulsion with gum-arabic, white sugar, and water. The diet is a subject of the utmost importance from the beginning of the disease till complete recovery ensues. From the various forms of farinaceous food, such as arrow-root, rice, sago, tapioca, bread, &c., from eggs beaten into custard, and milk with or without lime-water (or, preferably, effervescing Carrara water), an abundant, bland, and nourishing dietary can be selected. All animal food, excepting eggs and milk, must be rigidly prohibited. Even beef-tea and mild broths have often been found to exert a special irritant action on the overcharged glands of the ileum. During the period of convalescence, no meat should be allowed till at least a week has elapsed after all the febrile symptoms have vanished, and the only admissible means of opening the bowels are by castor oil or simple enemata.

Both typhus and typhoid fever have been described under various names. Typhus has been popularly known as the jail fever, hospital fever, putrid fever, brain fever, bilious fever, spotted fever, camp fever, &c.; while from the peculiar lesions which are associated with it, the terms enteric fever and intestinal fever have been suggested as appropriate synonyms for typhoid. Its latest name, for which Dr Murchison is responsible, is pythogenetic fever, or fever born of putrescence. If the term *intestinal fever*, suggested by Dr W. Budd, were adopted, much confusion would be prevented.*

Had our space permitted, we should have given a brief historical sketch of the principal epidemics of typhus fever. To confine ourselves to the present century, it may be mentioned, that during its first fifteen years the ravages of typhus in the armies of Napoleon, and among the population of the countries which were the seat of war, were perfectly appalling. In May 1812, the Bavarian army serving with the French numbered 28,000 men; in February 1813, the number was reduced to 2250, the great destroyer being typhus. In Mayence alone, of 60,000 French troops composing the garrison in 1813–1814, there died of typhus alone, in six months, 25,000 men. During the spring of 1856, more than 17,000 men of the French army in the Crimea perished from this disease in less than three months. According to Parkes, typhus fever occupies the fourth place amongst the causes which have produced loss of life in the British army, the three more potent causes being (1) a defective commissariat; (2) undertaking military operations in an unhealthy site, and with an unhealthy season impending; and (3) exposure to cold, with insufficient clothing and food. The present article, comparatively long as it is, contains but a very meagre outline sketch of the history and treatment of two of the most important diseases affecting the human body.—For further details, the reader

* Cases of continued low fever, whether typhus or typhoid, are frequently spoken of popularly and vaguely as *gastric* fevers; but the term is not recognised by the medical profession.

is referred to Aitken's *Science and Practice of Medicine*, 3d ed., vol. i., pp. 374—474, and to Dr Murchison's *Treatise on the Continued Fevers of Great Britain* (1863).

TYR is the old Norse name of a god, who, however, did not belong exclusively to the northern mythology, but was common also to the German, being called in old High German *Ziu* or *Zio*, and in Ang.-Sax. *Tiv*. He was the son of Odin, and was the god of war and of fame, which idea is expressed in old Norse by the word *tyr;* and when the Romans and Greeks speak of a Mars or an Ares among the Germans, it is Tyr that is meant. According to the Edda, he was single-handed. When the Asa-gods persuaded the wolf Fenrir to allow himself to be bound with the bandage Gleipnir, Tyr put his right hand in the wolf's mouth, as a pledge that he would be loosened; and when the gods refused to release him, the wolf bit off Tyr's hand to the wrist, which was called, in consequence, *Ulflithr*, or the Wolf's Joint. In the twilight-battle of the gods, he meets his death at the same time with his enemy, the monster dog, Garmr. The old Norse Runic character ᛏ bore the name of the god. The third day of the week, too, the *Dies Martis* of the Romans, is called after him, in old Norse, *Tyrsdagr;* Ang.-Sax. *Tivesday* (from which our English *Tuesday*); old Friesic, *Tysdei;* old High German, *Ziuwestac;* in the north of Germany, *Tiestac* or *Diestac*, from which the German of the present time, *Dienstag*. Places, and in particular hills and plants, were named after him. The word Tyr appears in epithets of Odin, signifying god in a general sense; as, for example, *Sigtyr*, that is to say, the god of victory; also in epithets of Thor, as *Reidhartyr*, the god of the chariot or of thunder.

TYRANT (Gr. *tyrannos*, Doric for *koiranos*, from *kuros* or *kurios*, a lord or master), a name given in modern times to an arbitrary and oppressive ruler, but originally applied, not necessarily to one that exercised power badly, but merely to one that had obtained it illegally, and therefore equivalent to our word *usurper*. The ancient Greek 'republics,' it must be remembered, were generally aristocratic and even oligarchic in their constitution. When the 'governing families' among the Athenian or Syracusan nobles, for example, quarrelled with each other, it was natural, if they could not otherwise agree, that the boldest and most reckless of the set should seek for success by allying himself with the masses of the people, should figure as their champion, promise to redress their wrongs or increase their comforts, and when a fitting occasion presented itself, should, by a clever if somewhat violent stratagem—*coup d'état*, it is now called—deliver them from the domination of his order by himself grasping possession of absolute power, and ruling without any other restraint than the necessity of retaining his popularity imposed—even this limitation being frequently absent when a body-guard of foreign mercenaries rendered it superfluous. If the political adventurer who thus rose on the ruins of the constitution happened to be a man of sense, and wisdom, and generosity, his 'tyranny' might prove a blessing to a state torn by the animosities of selfish oligarchs, and be the theme of praise in after-ages, as was the case with the 'tyrannies' of Peisistratos (q. v.), Gelon (q. v.), Hiero II. (q. v.), and many others; but if he was insolent, rapacious, and cruel, then he sought to reduce the citizens to a worse than Egyptian bondage, and his name became infamous to all time. Such has been the fate of most of the 'Thirty Tyrants of Athens' (q. v.), more particularly of the blood-thirsty Critias, of Alexander of Pheræ, of Dionysius the Younger, &c. It was the method of exercising authority pursued by these and similar usurpers that latterly, even in ancient times, gave the word tyrant that evil significance it has ever since uninterruptedly retained.—See Plasz, *Die Tyrannis bei den Griechen* (Bremen, 1852); Wachsmuth, *Hellen. Alt.*, vol. i., pp. 279—288; and the Histories of Thirlwall and Grote.

TYRANT SHRIKE, the popular name of a section of the Shrike family (*Laniadæ*), connecting that family with the Flycatchers (*Muscicapidæ*), and entirely American. In the genus *Tyrannus*, the bill is straight, rather long, strong, the upper mandible rounded above, the point suddenly hooked. The birds of this genus are remarkable for their fierce and bold disposition. They are always ready for battle, and often engaged in it. In defence of their young, they rush against any aggressor. The T. S., TYRANT FLYCATCHER, or KING-BIRD (*T. intrepidus*) of North America, has no hesitation in attacking an eagle, rising above him, and pouncing down upon him. This species migrates northwards in summer as far as lat. 57°. It feeds much on the larvæ of insects, but has an unfortunate fondness for bees, and will take its post on a fence or bush near a hive, to dart upon them as they depart or return; on which account it is disliked by American farmers. The true Tyrant Shrikes (*Tyrannus*) have the plumage of white and black, variously blended; but in the genus *Tyrannula*, which approaches more to fly-catchers, the plumage is olive-coloured.

TYRCONNEL, RICHARD TALBOT, EARL OF. See SUPPLEMENT in Vol. X.

TYRE (Phœn. *Sûr* or *Sôr*, rock), a city of ancient Phœnicia, situated in lat. 33° 12′ N., which probably derived its name from the double rock on which it was first founded. It was a matter of doubt among the ancients themselves whether T. or Sidon was the older of the two, and the question is one not easily to be settled. So much, however, seems certain, that T. had existed already independently for a long time, when Sidon, defeated by Ascalon, transferred herself almost bodily to the former (see PHŒNICIA). There were two towns of T. closely connected together in historical times; one on the continent, the other on the island opposite, together embracing about 19 Roman miles. The more important of the two was the continental town, called Palæ Tyrus; while the island-town served more or less for the purpose of store-houses, manufactories, arsenals, and the like. The situation of the entire city was one of the most fertile, and its magnificent combination of land and sea scenery formed the theme of many an ancient poet and seer.

Nothing but myths have come down to us respecting the earlier period of its existence. History begins to dawn upon us with Abibal, the predecessor of the biblical Hiram, under whose rule (980—947 B.C.) T. attained to its full glory and renown. An alliance with Solomon was also entered into; trading expeditions were undertaken jointly by the Israelites and the Phœnicians, and Solomon is supposed even to have married Hiram's daughter. During Hiram's reign, T. was much enlarged and embellished; and its two roadsteads and harbours, the wonders of the ancient world, probably date from the same period. He was followed, according to ancient writers, by Balæastartus; after him reigned, for brief periods, his four sons, by the murder of the last of whom the throne became hereditary in the house of Ithobaal, the Ethbaal of Scripture, whose daughter was married to Ahab. T. then appears to have gained the supremacy over Sidon, and also spread her colonies far and wide. Shortly after the death of the king, Carthage was

refounded by Elissa (Dido), about 813 B.C., in consequence of a popular demonstration, which deprived her of the throne in favour of Pygmalion. This 'new city' gradually diminished the importance of the old one; at least T. seems to have been weakened to such an extent by the emigration of its best elements, that it disappears from history until the three great powers, Chaldæa, Assyria, and Egypt, by turns endeavoured to make themselves masters of the Tyro-Phœnician coast, with its eastern and western trade. Shalmaneser, king of Assyria, reduced T., after a long siege; and the whole of Phœnicia, the most important places of which had already thrown off their allegiance to T., was rendered tributary to Assyria. During the Chaldæo-Egyptian struggle, T., again at the head of the country, sided with Egypt, and was conquered by the Chaldæans. Once more the Phœnicians attempted to throw off the foreign yoke, and Nebuchadnezzar marched against them at the head of his armies. Having taken Jerusalem (587 B.C.), he reduced the which sea-coast, except T., which stood a thirteen years' siege by water and by land, ending, not in subjection, but only in a kind of apparent submission, leaving the native sovereigns on their thrones, and their wealth and power untouched. In 538 B.C., Cyrus became master of Phœnicia, which at that time again stood under Babylonian supremacy, and the hegemony was bestowed upon Sidon. For a long time, Phœnicia prospered under wise Persian rulers; but when Xerxes, in his Greek wars, had completely destroyed the Phœnician fleet, and exhausted nearly all her resources, the exasperated inhabitants rose once more, but only to be utterly crushed. Sidon, at the head of the revolution, was fired by its own inhabitants, and once more T. resumed the lead (350 B.C.). Having refused to pay allegiance to Alexander the Great (after the battle at Issus), it was besieged by him in 332 B.C., and fell after a seven months' hard resistance. Alexander replaced the old inhabitants by new colonists, chiefly Carians, and though the city had sustained all but complete destruction, it yet rose again after a very brief period to wealth and power, and already in 315 B.C., was able to hold out for 18 months against Antigonus. Under the Romans, Cleopatra received T. as a present from Antony; but the last trace of its independent existence was taken from it by Augustus. A Christian community was founded there at an earlier period. The trade and manufacture of T., aided by her exceptionally favourable naval position, insured for it, even under Roman dominion, a high place among its sister cities; and once more, in 193 A.D., it even took an active part in the contest between Septimius Severus and Pescennius Niger, which, resulting in the success of the former, brought back to it some of its ancient distinction. In St Jerome's time, it was again the noblest and most beautiful city of Phœnicia, nay, one of the most prosperous and noble cities of the whole East. In the 7th c., it came under the dominion of the Saracens, and so remained until taken by the Crusaders; and in 1192 A.D. became the northern boundary of Christian territory in Palestine. It continued to flourish—still chiefly through its world-renowned purple—until 1516 A.D., when the conquest of Selim I., together with the newly discovered route to Asia by the Cape of Good Hope, put an end to its wealth and commerce, and almost to its existence. Although there has been a slight improvement in its prospects of late, the desolation and wretchedness of that once magnificent city are still most striking. From 3000 to 4000 inhabitants now dwell among the ruins of its ancient glory, finding very livelihood in insignificant exports of tobacco, cotton, wool, and wood. Frederick Barbarossa and Origen are both buried here.

TY'RNAU (Magyar *Nagy-Szombath*), a town of Hungary, county of Ober-Neutra, on the river Trna, about 30 miles north-east of Presburg. It has so many churches and convents that it has been nicknamed 'Little Rome.' T. carries on manufactures of cloth, linen, woad, &c., and has a tolerably lively general trade, especially in wine. From 1635 to 1774, it possessed a university, which in the latter year was transferred to Pesth. T. is likewise famous for a huge cask, which can hold twice as much as the great Heidelberg one. Pop. 7600.

TY'ROL, THE, the most western province of the Austrian Empire, lying in 45° 40′—47° 44 N. lat., and 9° 32′—12° 55′ E. long., is bounded on the N. by Bavaria, on the E. by Salzburg, Carinthia, and Venetia, on the S. by Italy, and on the W. by Switzerland and Italy. Area, 12,311 sq. miles; pop. in 1880, 912,549.

Surface.—The T. may be regarded as an eastern continuation of Switzerland. It is traversed from east to west by the great chain of the Alps, and is encircled on all sides by lofty ranges. It consists, however, almost entirely of three great valleys—(1) one running east and west north of the Great Alps, and drained by the Inn; (2) one south of the Alps, also running east and west, and drained by upper tributaries of the Adige or Etsch; (3) one running south from the middle of the last, and drained by the main stream of the Adige. These valleys are surrounded by a circuit of mountains. The northern valley is separated from Bavaria by the Algau Alps. The southern valley is bounded on the E. by the Trent Alps; on the W. by the Ortler Alps, which, like protecting walls, run south into the plain of Lombardy. The main chain is crossed towards the centre of the T. by a deep depression, in which lies the Brenner Pass (elevation, 4657 feet). It is the lowest of the great passes of the Alps, and that over which runs the great commercial route connecting Italy and Germany.

The dialect and manners of the Bavarians prevail in the northern and middle valley. The dialect and manners of Lombardy, on the other hand, have crept up the third valley to a boundary-line which rests upon the mountains which bound the middle valley on the south. Hence the most important divisions of the T. are into the German Tyrol and the Italian Tyrol. The German T. is divided into (1) the Oberinnthal, or the Upper Inn Valley; (2) the Unterinnthal, or the Lower Inn Valley; (3) the Vintschgau; (4) the Etsch district; and (5) the Pusterthal, the three last belonging to the middle valley of the Tyrol. Beyond the geographical limits of the T., the Austrian province of the T. includes (6) the Vorarlberg, a district drained by streams which fall into the Lake of Constance, and in which a dialect is spoken resembling those of German Switzerland; and (7) the Lienz district, on the Drave, in which the language of the people is Austrian. The Italian T. is divided into (1) a northern valley, or that of Trent; (2) a southern valley, or that of Roveredo; (3) the valley of the Sarca, or district of Riva, on Lake Garda.

Geology and Soils.—The rocks of the T. are chiefly crystaline Silurian and Secondary, with obtruding granites and traps. The chief mineral products are iron, rock-salt, worked near Innsbruck, and marble quarried in the south. The Tertiary strata of the Swiss and Swabian plains are totally wanting; and it is only along the water-courses that level tracts of recent formation are found. These tracts are the only parts of the country admitting of cultivation by the plough, and they very seldom attain a width

of more than half a mile. Taken altogether, they do not form more than one-tenth of the whole country

Climate.—The loftiest mountains of the T. are in the main chain of the Alps—the Gross Glockner (12,776 feet), east of the Brenner Pass, and Mount Gebatsch (12,276 feet) west of it, and, in the Ortler chain, the Ortler Spitz (12,818 feet). These mountains are covered with vast glaciers, which descend, like those of Switzerland, far into the valleys. Between 6000 and 5000 feet, snow disappears in summer, and alpine plants and grass cover the hills, diversified here and there with stunted bushes. Into this region the herds are driven, as in Switzerland, during the summer months. Below 5000 feet, the fir-woods abound; potatoes and a few vegetables are cultivated, and houses permanently occupied make their appearance. The beech replaces the fir at 4000 feet, and agriculture begins, the chief grains being rye and barley. Wheat is not cultivated with success at a higher elevation than 2000 feet. In the lower part of the southern valley, the temperature is highest, and indeed the climate is that of Northern Italy; tobacco, the fig, the olive, and the mulberry being enumerated among the chief objects of cultivation. Out of every 100 acres of the T., 30 are inaccessible mountain-tracts, 40 forests, 20 commons and meadows, and 10 corn-fields and gardens.

Industry.—The industry of the T. is not important. There are, however, glass and paper factories near Innsbruck; and carpets, linens, gloves, and straw-hats are manufactured extensively for home consumption. Wooden ware is also largely produced. The rearing of canaries is a business which was long a monopoly of the northern Tyrolese, who supplied all Europe with these birds. The exports from the T. consist of cattle, cheese, timber, wine, tobacco, silk, iron, and salt. The imports are grain and manufactured goods. The transit-trade between Italy and Germany gives employment to a large number of the inhabitants. Thousands migrate annually into neighbouring countries, to sell their wood-wares, gloves, and carpets. Railways have for some time connected Innsbruck with Munich, and Botzen and Trent with Verona. One is in progress over the Brenner Pass, which will connect these, and complete the communication by railway between Italy and Germany.

Inhabitants.—In 1868 the northern or German Tyrolese bore to the southern, or Italian, the proportion of five to three. The habits and language of the people resemble those of the adjoining parts of Italy and Germany. In the T., according to the census of 1857, the inhabitants were all Catholics, with the exception of 548 Jews, 74 Protestants of the Augsburg Confession, 41 of the Reformed Church, and 1 Unitarian. The Tyrolese have an independent national diet, meeting at Innsbruck, in which are represented all classes of the population, the clergy, the nobility, the people of the country, and those of the towns. There are, to some extent, separate administrative arrangements for the Italian districts. Education is now very generally diffused, and one of the nine Austrian universities is at Innsbruck.

History.—The history of the T. is partly German and partly Italian. In early times, the T. formed part of Rhætia, and was conquered by the Romans, 15 B.C. Subsequently it was overrun by various German tribes; still later the southern valley fell to the share of the Lombards, the two northern valleys to the Bavarians. The latter valleys were divided into *gaus*, which ultimately became petty lordships, acknowledging the supremacy of the dukes of Bavaria. These lordships, however, in the course of time, came to be represented by two families who intermarried. Then the whole German T. was governed by one family of counts, whose paternal abode was the mountain fortress of Terioli, or Tyrol, near Meran. The last count, who died in 1335, left one daughter, Margaret Maultasche. She bequeathed her rights to her cousins, the dukes of Austria, who, in consequence, acquired possession of the T. in 1363. The Italian valley formed the bishopric of Trent. During the wars of Napoleon, the German T. was ceded to Bavaria, much to the discontent of the population, who were warmly attached to the House of Austria. They made a gallant resistance to the French in 1809, under Andreas Hofer, but were defeated; and the Northern T. was not restored to Austria until the Treaty of Paris in 1814. The Southern T., which had been annexed to Italy, was restored to Austria in the following year. An application was made by the inhabitants of the Italian T., a few years ago, to the Austrian government to be rendered entirely independent of the German inhabitants of the northern valleys; but it led to no important change in the administration. It shewed, however, the desire of the Southern Tyrolese to be considered Italians rather than Germans, and it was believed that on the event of a successful war for the recovery of Venice, the whole of the Southern T. would be handed over to the kingdom of Italy. This expectation has not been realised. By the treaty of peace between Austria and Italy (a summary of which appeared in the *Times*, October 12, 1866), it is declared that the frontiers of the Venetian provinces ceded to Italy are the administrative frontiers of these provinces under the Austrian rule. Even the shores of Lake Garda remain Austrian. How long this arrangement will last, it is hard to predict. The trade of the Southern T. is entirely with the south, its wood and cattle being exchanged for the corn of Lombardy, and it is asserted that if any attempt is made to enforce custom-house regulations on the frontier, the inhabitants will not rest satisfied until they have secured the annexation of their territory to Italy.

TYRO'NE, an inland county of the province of Ulster, Ireland, bounded on the N. by Londonderry, on the E. by Armagh and Lough Neagh, S. by Monaghan and Fermanagh, and W. by the last-named county and Donegal. A portion of Lough Neagh is assigned by the Ordnance Survey to this county; and, including this portion, the whole area is 1260 sq. m., or 806,640 acres, of which 450,286 are arable, 311,867 uncultivated, 31,796 under water, 11,981 in plantations, and 710 in towns. The pop., in 1871, was 216,668, of whom 119,890 were Roman Catholics, 49,499 Protestants of the Established Church, and 42,040 Presbyterians. The pop. in 1881 was 197,719. Of the arable land, in 1872, 267,252 acres were under crops of various kinds. In the same year, the stock amounted to 24,417 horses, 180,302 cattle, 55,691 sheep, and 42,257 pigs. The surface, in general, is hilly, and often extremely picturesque, this county lying for the most part between the two great mountainous districts which traverse Ulster from east to west. With the exception of Lough Neagh, the lakes, which are numerous, are small. The principal rivers are the Blackwater, the Camowen, and the Ballinderry, of which the two former are navigable. The county is traversed by railways, which connect it with Dublin, Belfast, and the sea-coast at Dundalk. The geological structure is very much diversified. The north-western mountains are chiefly mica-slate, with primitive limestone, and rise in Slieve Sawel to a height of 2236 feet. Those on the north-east are of greenstone, with granite and occasional red sandstone. The plain, of which Omagh is the centre, is a Tertiary

formation, with irregular beds of lignite, red marl, and new red sandstone; and between Dungannon and Stewartstown there is a small coal-field, the produce of which is rich, and resembles the coal of Ayrshire. The rest of the plain belongs to the general limestone district. The climate is moist, and the low lands are often flooded. The soil of the plain is a fertile loam; that of the hilly districts, sandy or gravelly. There is a large proportion of bog, the turf of which supplies the chief part of the fuel consumed by the population.

The chief towns are Omagh, Strabane, Dungannon, Cookstown, Aughnacloy, Castlederg, and Clogher, which gives its name to the episcopal see. T. returns three members to the imperial parliament, two for the county, and one for the borough of Dungannon.

T. was anciently known as the district of Hy-Briun and Hy-Fiachra; and in later Celtic times was called Kinel Eogain, or Tir-owen, whence its modern name. See ULSTER.

TYRRHENIAN SEA (anc. *Tyrrhenum Mare*), that part of the Mediterranean Sea (q. v.) between the islands of Corsica, Sardinia, and Sicily on the west, and the Italian peninsula on the east.

TYRTÆ'US, famed for his political elegies and marching-songs, was the son of Archembrotus, of Aphidnæ, in Attica; according to another conjecture, he was a Lacedæmonian; while the story which represents him as a lame schoolmaster, of mean family, whom the Athenians (ignorant of his lyric power, and jealous of Lacedæmonian domination in the Peloponnesus) sent to the Lacedæmonians, during the second Messenian war, as the most inefficient commander they could select, must be received as a fiction of later times. He rendered, however, to the Lacedæmonians a kind of assistance which the Athenians little foresaw; and while by his elegies he stilled their dissensions at home, by his war-lyrics, he so animated their courage in the field, that they were finally triumphant in their conflict with the Messenians, whom they reduced to the condition of Helots. This success of his poems T. lived to see, and must accordingly have flourished down to 668 B.C., the last year of the second Messenian war. The best edition of the text of T. is that of Bergk in his *Poetæ Lyrici Græci*.

TYTLER, WILLIAM, the author of several literary works of considerable merit, the principal being an *Inquiry, Critical and Historical, into the Evidence against Mary Queen of Scots*, in which it is attempted to vindicate that unhappy princess from the charges brought against her by Robertson and Hume. T. was born at Edinburgh in 1711, educated in Edinburgh, admitted a member of the Society of Writers to the Signet in 1742, and died in 1792. He was father of Alexander Fraser Tytler, Lord Woodhouselee, and grandfather of Patrick Fraser Tytler the historian. T. was an accomplished musician, and distinguished for his general culture and taste in the fine arts.

TYTLER, ALEXANDER FRASER, a historical writer, and a judge of the Court of Sessions in Scotland under the title of Lord Woodhouselee. He was the eldest son of William Tytler (q. v.), the vindicator of Queen Mary, and was born at Edinburgh in 1747, educated principally in Edinburgh, and admitted to the Scottish bar in 1770. He obtained, in 1780, the professorship of History in the university of Edinburgh; in 1790, the office of Judge-admiral of Scotland; and in 1802, was raised to the bench of the Court of Session. His acquirements were of the most varied kind, embracing most departments of literature and the fine arts. His writings include a biography of Henry Home, Lord Kames; a Dictionary of Decisions of the Court of Session; and the work by which he is best known, his *Elements of General History*, first published in 1801, which has been translated into most of the languages of Europe, and even into Hindustani. He died in 1813.

TYTLER, PATRICK FRASER, an eminent historical writer, fourth son of Alexander Fraser Tytler, Lord Woodhouselee. He was born in 1791, educated partly in Edinburgh, partly in England, and called to the Scottish bar in 1813. Of his various literary and historical works, the most valuable is his *History of Scotland*, beginning at the accession of Alexander III., and terminating at the union of the crowns, a book of more critical research than any work on the same subject that had preceded it. His writings also include a life of the Admirable Crichton, a life of Wickliffe, a memoir of Sir Thomas Craig, and a collection of original letters, illustrative of the reigns of Edward VI. and Mary. In consideration of his merits as a historian, Sir Robert Peel's government conferred on him a pension of £200 a year. He died at Malvern, 24th December 1849. His talents were such as qualified him in a remarkable degree to shine in society, and his amiable and excellent private character have been the subject of deserved eulogy.—See Burgon's *Life of Patrick Fraser Tytler* (1859).

TZETZES, JOHANNES, a Byzantine (Greek) author flourished during the latter half of the 12th c., is known as the author of certain works in prose and verse, which, though excessively dull, and without a vestige of literary genius, are valuable as storehouses of classical information, not elsewhere to be had. The principal are—1. *Iliaca*, consisting of three distinct poems, entitled *Ante-Homerica, Homerica*, and *Post-Homerica;* or in Greek, *Ta pro Homerou, ta Homerou, kai ta meth' Homeron;* a complete edition of which was first published by Fr. Jacobs (Leip. 1793), but the most critical edition is that of Bekker (Berl. 1816); 2. *Biblos Istorike*, more commonly called *Chiliades*, or a collection of more than 600 stories, mythical, legendary, &c.; best edition that of Kiessling (Leip. 1826), written in that worthless sort of verse, called *political*, which had regard only to syllables, and not to quantity; besides commentaries on Homer, Hesiod, and the *Cassandra* of Lycophron. Several poems and commentaries of T. exist in MS., that have never yet been published.—T. had a brother, ISAAC, who probably had some share in the commentary on the *Cassandra*.

U

U THE twenty-first letter of the English alphabet, represents in that language three distinct sounds, as heard in *tube*, *tub*, and *full*. The last is its primitive sound, which it had in Latin, and which it has preserved in German and Italian, but which is oftener denoted in English by *oo*. In *tube*, it does not mark a pure vowel sound; it is aspirated, as if *y* were prefixed—*tyub*. The sound heard in *tub* is characteristic of English; and, owing perhaps to the decided emphasis given to one syllable of a word at the expense of the rest, there is a tendency to allow the other vowels, *a*, *e*, *o*, when unaccented, to degenerate into this indistinct, stifled sound: *cavalry*, *sister*, *fashion* are pronounced almost, if not altogether, as if written *cavulry*, *sistur*, *fashun*. This is especially the case with *o*; and in this vowel the degeneracy is not confined to unaccented syllables; in a whole host of words, the accented *o* is exactly equivalent to *ŭ*—e. g., *come*, *money*, *among*. Perhaps a similar tendency in Latin may account for the prevalence of *u* in that language as compared with Greek—e. g., Lat. gen*u*s = Gr. gen*o*s; vol*u*mus = boul*o*metha; spat*u*la = spat*a*le; scop*u*l*u*s = skop*e*l*o*s. *U*, in Latin, sometimes goes into the still thinner sound of *i*; thus *maxumus*, *caputis*, degenerated into *maximus*, *capitis*. Of the labial series of vowels (see Letters), *u* approaches nearest to the labial consonants; so much so, that in Latin the vowel *u* and the consonant *v* were both denoted by the same character, *v*, of which *u* is only a later modification. In the middle ages, the two characters were used indifferently whether as vowel or consonant; and it was only in the 16th c. that the Dutch scholars fixed the use of the character *u* for the vowel, as distinct from *v*.

UBE'DA, a town of Spain, Andalusia, in the modern province of Jaen, stands on an olive-clad slope in a cultivated plain, 26 miles north-east of the town of Jaen. It contains some fine specimens of architecture, of which the chief is the cathedral. It was built by the Moors, and under them it is said to have contained 70,000 inhabitants. There are now only about 15,000, who are engaged in agriculture, in the manufacture of porous vessels, made of red and white clay.

UCAYALI, river. See Supplement in Vol. X.

U'DAL RIGHT, in the Law of Scotland, means that right in land which may be completed without charter and sasine by undisturbed possession provable by witnesses before an inquest. Though dependent on the crown as superior, the vassal pays only a tribute called skat. The right is said to have been the old tenure prevalent in Britain before the feudal system was introduced, and prevails chiefly in Orkney and Shetland. The lands held on udal right are now commonly converted into feus.

UDI'NÉ, a city of Northern Italy, Venetia, capital of the province of the same name, called also the province of Friuli, situated in a fertile plain, about 75 miles north-east of Venice by railway. It is a walled town, 4 miles in circumference, with wide, handsome streets and squares. The castle, which stands on a hill in the midst of the city, was formerly the residence of the patriarchs of Aquileia, and is now the seat of the tribunals. The Antonini Palace is a work of the architect Palladius. U. trades in silk, in copper utensils, and rosolio. There are leather, paper, and silk factories. Pop. about 20,000. Two miles from U. stands the village of Campoformio, where, in 1797, the treaty between Bonaparte and Austria was signed, by which Venice was ceded to the latter.

U'FA, a government of Russia, formed in 1865 out of the five north-western districts of Orenburg, and separated from the present government of Orenburg by the south-west branch of the Ural Mountains. See Orenburg.

UFA, capital of the government of the same name, on the right bank of the Biëlaia, or White River. It was built in 1573, in the reign of Ivan IV. It contains 12 churches and 24 manufactories, the principal articles of trade being honey, wax, fat, furs, and skins. The Biëlaia, an affluent of the Kama, and thus connected with the Volga, is here navigable for large ships. Pop. 20,000.

UGLI'TCH, a town of Great Russia, in the government of Jaroslav, on the right bank of the Volga, 488 miles south-east of St Petersburg. In early times, it was the chief town of an independent principality of the same name. After the assassination at U. of Prince Dmitri, son of Ivan IV., in 1592, the majority of the inhabitants of the town were banished to Siberia and other distant quarters, and the town, formerly prosperous, became deserted. U. contains 24 churches, 2 cloisters, and 14 manufactories—linen, weaving, and tanning being the principal branches of industry. Pop. 13,126.

UHLAND, Joh. Ludwig, a celebrated German poet, was born at Tübingen, 26th April 1787, studied at the university of his native city, and first appeared as a writer of verse in Seckendorf's *Musenalmanach* (1806—1807). For several years he continued to publish ballads and other lyrics in various periodicals, the first collection of which, under the title of *Gedichte*, appeared in 1815. To this he kept adding all the rest of his life, and it is on these *Gedichte* that his fame rests. Their popularity has been, and continues to be as great as it is merited, upwards of a dozen editions having been published. Other productions of U.'s are his admirable essays, *Ueber Walther von der Vogelweide* (Stuttg. 1822), and *Ueber den Mythus der nord. Sagenlehre vom Thor* (Stuttg. 1836); a masterly collection of old popular songs (*Alter hoch und niederdeutscher Volkslieder* (Stuttg. 1844—1845); and two dramas *Herzog Ernst von Schwaben* (Heidelb. 1817), and ***Ludwig der Baier*** (Berl. 1819). He died at Tübingen,

13th November 1862. U. was a patriotic politician as well as a poet. He entered the representative assembly of Würtemberg in 1819 as deputy from Tübingen, and proved an active member of the liberal party. He was also a delegate to the Frankfürt Assembly of 1848; but though Germany has reason to be grateful for his services to the cause of constitutional liberty, it is as a poet he will be best remembered. His pieces are full of spirit, imagination, and truth, finely picturesque in their sketches of nature, and exquisite in their varied tones of feeling. Nothing, indeed, can surpass the brevity, vigour, and suggestive beauty of his ballads, in which a romantic sweetness of sentiment and a classic purity of style are happily combined. U. is the acknowledged head of the 'Suabian School' of German poets. See Pfizer's *Uhland und Rückert* (Stutt. 1837). Longfellow has translated some of U.'s ballads, in his *Hyperion*, into English; and Mr Platt has published a volume of translations (Lond. 1848), with a memoir prefixed.

U'HLANS (a Tartar word signifying 'brave'), light cavalry of Asiatic origin, were introduced into the north of Europe along with the colonies of Tartars who established themselves in Poland and Lithuania. They were mounted on light active Tartar horses, and armed with sabre, lance, and latterly with pistols. Their lance was from 5½ to 6½ feet in length, and like that of the modern 'lancers,' was attached to a stout leather thong or cord, which was fastened to the left shoulder, and passed round behind the back, so as to allow the lance to be couched under the right arm. Immediately below its point was attached a strip of gaudy-coloured cloth, the fluttering of which was designed to frighten the enemies' horses. The early dress was similar to that of the Turks, and the regiments, or *polks*, were distinguished from each other by the red, green, yellow, or blue colour of their uniforms. The Austrians and Prussians were the first to borrow this species of cavalry from the Poles. In 1734, an attempt was made by Marshal Saxe to introduce the U. into France, and a 'polk' of 1000 men was formed; but it was disbanded at its author's death. The Prussian Uhlans won great renown in the Franco-German war of 1870—1871 by their bravery and marvellous activity. The Prussians applied the term, however, rather loosely, including all their light cavalry under the designation.

UIST, NORTH AND SOUTH, two islands of the Outer Hebrides, are situated from 15 to 18 miles west of the Isle of Skye, from which they are separated by the Little Minch. Unlike the other islands of the Hebrides, the east coasts of North and South U. are much and deeply indented, while the west coasts are, as a rule, almost unbroken.—NORTH U., between which and *South U.* the island of Benbecula intervenes, is 18 miles long from west to east, and from 10 to 3 miles in breadth. The eastern half of it is so cut up by lochs and watercourses as to have the appearance of an archipelago. This region is a brown, peaty, dreary bog, partly relieved, however, by a line of low hills running along the coast at the distance of about 2½ miles. In the west part, which, as a rule, is hilly, there is a tract of uneven, low land, exceedingly beautiful in certain seasons, rendered fertile by the drifting of shell sand from the coast, and producing good clover and grain crops. Population, 3371.—SOUTH U., 20 miles long, and 7 miles broad. Its east coast is much indented by the lochs Skiport, Eynort, and Boisdale. The eastern district is upland; the western is alluvial and productive, under proper treatment. Pop. 3669, engaged, like the inhabitants of North U., in fishing and agriculture.

UJEI'N, one of the seven sacred cities of Hindustan, in Sindia's dominions, of which it was formerly capital, stands on the right bank of the Sipra, 35 miles north-north-west of Indore. It is surrounded by walls with round towers, is six miles in circumference, contains the grand palace of the head of the Sindia family, several mosques and mausoleums, an observatory, and an antique gate, supposed to date from before the Christian era. An active trade is carried on in cloths, opium, &c. The number of the inhabitants is not ascertained.

U'JHELY-SATORA'LYA, a market-town of Hungary, 105 miles north-west of Pesth. It stands on the Hegyalya Mountains, contains several churches and a gymnasium, and is noted for its wine-culture. Pop. 7200.

UKA'SE, or UKAS (Russian *ukasat*, to speak), a term applied in Russia to all the orders or edicts, legislative or administrative, emanating from the government. The ukases either proceed directly from the emperor, and are then called *imenny ukas*, or are published as decisions of the directing senate. Both have the force of laws till they are annulled by subsequent decisions. Many ukases are issued in the course of one reign; and as an immense chaos of ukases had accumulated since 1649 (the date of the last codification of laws), the Czar Nicholas ordered (1827) that a collation of them should be made. The result was a collection of laws in 48 volumes, which has been supplemented year by year by volumes of new ukases, and which, after the elimination of such ukases as are unimportant or of temporary authority, constitutes the present legal code (*svod*) of the Russian Empire. The *prikases* are imperial 'orders for the day,' or military orders given during a campaign.

UKRAI'NE (Slav. a frontier country or March), the name given in Poland first to the frontiers towards the Tartars and other nomads, and then to the fertile regions lying on both sides of the middle Dnieper, without any very definite limits. The U. was long a bone of contention between Poland and Russia. About 1686 the part on the east side of the Dnieper was ceded to Russia (Russian U.); and at the second partition of Poland, the western portion (Polish U.) also fell to Russia, and is mostly comprised in the government of Kiev. The historic U. forms the greater part of what is called Little Russia (a name which first appears about 1654), which is made up of the governments of Kiev, Tchernigov, Poltava, and Kharkov.

ULCERA'TION is 'that part or effect of an inflammatory process in which the materials of inflamed tissues liquefy or degenerate, are cast off in solution or very minute particles from free surfaces, or, more rarely, are absorbed from the substance of the body.'—Paget on 'Ulcers,' in Holmes's *System of Surgery*, vol. i. p. 197. Generally speaking, however, the name of ulcer is not applied to any inflammatory result, unless the substance of a tissue deeper than the epithelial is exposed; and when the cast-off particles are only epithelial, the result is termed desquamation, abrasion, or excoriation, although the process may be essentially the same. Ulceration is closely allied to gangrene, the two processes differing in degree rather than in kind. 'When the degenerate or dead substance,' says Mr Paget, 'is cast off in one or more portions visible to the naked eye, the process is usually called gangrene; when the portions are not so visible, or are quite dissolved, it is called ulceration.' The degenerate tissues are always suspended or dissolved in a liquid, termed the 'discharge,' or 'ichor,' which varies in appearance and properties according to the cause and characters of the ulcerative

process. 'From some ulcers, e. g., the primary syphilitic, it is contagious; from many, it appears corrosive, exciting by its acridity inflammatory changes in the tissues with which it is in contact.'

ULCERS (derived from the Latin *ulcus*, a wound) may be arranged either according to the constitutional or specific disease from which they are derived, or according to the characters which they present. According to the first system, we speak of ulcers as healthy, inflammatory, strumous, &c.; while, according to the second, they are named irritable, chronic, sloughing, &c. In this article, we shall adopt the former of these arrangements, as being, upon the whole, the most satisfactory, although each possesses its own advantages.

A *common, simple, or healthy ulcer* is such as is left after the separation of an accidental slough in a healthy person, and is merely a healthy granulating surface, tending to cicatrisation. Its edges shelve gently down to the base, and are scarcely harder than the adjacent healthy skin. Their surface near the border is of a purplish blue tint where the young epidermis modifies the colour of the healing granulations; and within this, the granulations have a deeper hue than those at the centre, being most vascular where the cuticle is being chiefly developed. The discharge from such an ulcer is healthy or 'laudable' pus. The only treatment required is a little dry lint, if there is much discharge; or the water-dressing, if the sore is comparatively dry. When the granulations are too luxuriant, they must be touched with nitrate of silver, and dressed with dry lint. *Inflammatory ulcers* differ less than most kinds from the above described common or healthy ulcers. They commonly arise from some trifling injury, such as a blow or slight abrasion of the skin, which, to a healthy person, would have done no harm. Their most common seat is on the lower half of the leg or shin. The surface is red, and bleeds easily; the discharge is thin and watery; the edges irregular or shreddy; and the surrounding skin shews a red tinge, and is the seat of a hot and aching sensation. This ulcer most commonly occurs in the infirm and old, the ill-fed and overworked. Hence constitutional treatment, good diet, and complete rest (with elevation of the limb) are here demanded, in addition to water-dressing or lead-lotion applied warm. *Senile ulcers* usually present very little discharge, exhibit granulations of a rusty red tint, and are surrounded by a dusky red area. Nourishing food, wine, bark, and the mineral acids are here required, and opium in small repeated doses is often serviceable. The local treatment must be of a stimulating nature; and in bad cases, Mr Paget recommends strapping the leg daily with a mixture of resin ointment and Peruvian balsam spread on strips of lint. *Strumous* or *scrofulous ulcers* usually occur as the consequence of scrofulous inflammation in the subcutaneous tissue or lymphatic glands. They most commonly occur in the neck, groins, cheeks, scalp, and the neighbourhood of the larger joints. The discharge is thin, and of a greenish-yellow tint. These ulcers are seldom very sensitive or painful. The general treatment must be that recommended for constitutional Scrofula (q. v.). Iodine, in some form or other, is the best local application. A poultice of bruised and warmed sea-weed is a very popular remedy; but there is probably nothing so efficacious as tincture of iodine diluted with water till it causes only a slight discomfort, and applied three or four times a day. (About 30 drops of the tincture may be added to an ounce of water, to begin with.) Of the numerous other species distinguished by Mr Paget, we shall briefly notice the *Varicose, Indolent*, and *Sloughing Ulcer*. *Varicose Ulcers* are connected with an enlarged or varicose state of the veins of the lower extremity, which weakens the parts, and renders them especially liable to ulceration. See VARICOSE VEINS. The *chronic, indolent, or callous ulcer*, beyond all doubt, gives more trouble to the poor-law medical officer and the workhouse surgeon than any other half-dozen surgical affections. It is usually seated in the lower half of the leg, and is most commonly of an oval form, with its long axis parallel to that of the leg. 'Its base lies deep, and is flat, pale, or tawny and dusky, with very minute or no visible granulations. The margin is usually abrupt, or unequally shelving, and in its most characteristic form, strictly overlaid with opaque, white, dense epidermis.'—Paget, *op. cit.*, p. 217. Many volumes have been written on the proper means of treating this form of ulcer. The distinguished surgeon from whose Memoir we have so largely quoted, especially recommends opium, regulated pressure, and blistering. A grain of opium night and morning is usually sufficient. The pressure is applied with straps of adhesive or lead plaster on linen. The object of blistering is not only to stimulate the ulcer, but to soften its callous edges by causing absorption of part of the exudation with which they are infiltrated, and desquamation of the cuticle which covers them. The expediency of healing old ulcers of this kind has often been called in question, inasmuch as apoplexy, palsy, mania, and other serious diseases are said to have followed the healing of such ulcers. In the following cases, it may be decided that a cure should not be attempted. (1) If the ulcer be affected by the gout, having regular attacks of pain, returning at stated periods, and similar to what the patient has experienced from gout in other parts. (2) If an ulcer habitually occur whenever the constitution is disordered. (3) If the patient be very infirm and old; for under these circumstances the removal of a habitual source of irritation, or the diversion of a habitual efflux of blood, may prove fatal; and especially as very old ulcers have been known to heal spontaneously a short time before death. To these cases, specified by Sir E. Home, Dr Druitt adds (4) that of ulcers on the legs of stout women about the critical period of life, and displaying a tendency to discharge profusely as the menstrual discharge diminishes. To counteract these dangerous tendencies, the bowels should be freely purged during, and for some time after, the cure of an old ulcer; and if there are any symptoms of congestion in the head, a seton should be inserted in the back of the neck.

For the treatment of *Sloughing Ulcers*, we must refer to the article SYPHILIS.

ULEABORG, a seaport town of Russian Finland, capital of the government of the same name, stands on the south bank of the Ulea, on the eastern shore and near the head of the Gulf of Bothnia. It was founded in 1605, and the privileges of a port were granted to it in 1715. In 1822, it suffered severely from fire. The harbour has of late years become so shallow, that vessels are obliged to unload in the roadstead, four miles from the town. Pop. about 8000, who are engaged in the dockyards, sawmills, and breweries of the town. In 1854, an English flotilla burnt the government property in the place.

ULE'MA, the collective name of a certain class of theological jurists in Turkey, who, as is the case in Mohammedan countries, derive their decisions from the Koran and its commentaries. The Ulema enjoys many privileges; he pays no taxes, cannot be condemned to death or deprived of his property by any court of law. He can only—eventually—be deposed and banished. The ulemas

have to recognise, save their two immediate superiors (the *kadiasks* or *kadilesks*), only the mufti as their chief authority, whilst they are the superiors of all the Mollahs (q. v.) in the different provinces. The kadis form the lowest judicial class, and are subject to the mollahs in every respect.

U'LEX. See FURZE.

ULFILAS (*Ulphilas*, *Wulfilas* = little wolf), the celebrated translator of the Bible into Gothic, was born about 318 A.D., of Marcomannian parents, north of the Danube, among a Gothic population. Consecrated bishop in 348, he was expelled by his heathen compatriots from his native place, and sought refuge, together with a number of newly-converted Christians, in Lower Mœsia, at the foot of the Hæmus, where he remained for thirty years. In 388, he went to Constantinople (whither he had gone once before to assist at a council, in 360), and died there shortly afterwards. He was one of the chief lights of Arianism (see ARIUS), in the interest of which he exerted himself with the utmost energy. Nor was his political influence less felt among his Gothic countrymen; and the contemporaneous Greek historians, no less than those that followed within a short time after his death, are unanimous in attributing to him the largest share in the religious and social development of the Gothic population. His greatest work, however—one which will render his name famous for all ages—is his Gothic translation of the Bible, a work by which he contrived both to fix the Gothic language and to perpetuate Christianity among the Gothic people. Familiar with Latin, Greek, and Gothic, and accustomed to write in each of them, he undertook to render the whole Bible, with the exception of the two warlike books of Samuel and Kings—the influence of which he feared for his easily inflammable people—into a language which till then had, as far as we know, never been used for any literary composition of importance. Up to the 9th c., this sacred and national work accompanied the Goths in all their migrations. But from that period forth, nothing was known of it beyond what was found stated in the ancient ecclesiastical accounts. It was not till the end of the 16th c. that Arnold Mercator discovered in the Abbey of Werden the four Gospels of Ulfilas. Thence it found its way to Prague, where it remained till 1648, when the Swedes took it as a spoil to Upsal, where it still remains in the University Library, under the name of the *Codex Argenteus*. In 1818, further remnants of the work—a great portion of the Letters of St Paul—were discovered by A. Mai and Castiglioni, on palimpsests, in a Lombardian monastery, which, added to a few minor fragments, bring the New Testament somewhat near completion. But hardly anything—save a few passages from Ezra and Nehemiah—has survived of the Old Testament. The immense importance of this sole Gothic remnant for Teutonic philology cannot well be overrated. It is principally through it that the wonderfully fine structure of Gothic—a Germanic dialect of surpassing wealth and purity—has become known.

U'LLSWATER, after Windermere, the largest of the English 'Lakes,' lies between the counties of Cumberland and Westmoreland, 10 miles east of Keswick. Length, 9 miles; breadth, 1 mile. Its scenery has none of the soft beauty of that of Windermere, but is rugged and grand. One of the chief features of the landscape is the lofty mountain Helvellyn, which rises from the south-west extremity of the lake.

ULM, the second city of Würtemburg, in 49° 54′ N. lat., and 8° 8′ E. long., was, till the war in 1866, a stronghold of the Germanic Confederation, garrisoned by troops of Würtemberg, Austria, and Bavaria. It is situated at the junction of the Blau with the Danube, which then becomes navigable, 53 miles west of Augsburg by railway. A beautiful bridge, built in 1832, unites the city to New Ulm, a village on the Bavarian side of the river. The streets are narrow, and the buildings old. Pop. (1867) 24,739; (1880) 32,773. The environs are flat; but a league to the north, softly undulating heights begin.

The cathedral is remarkable for architectural beauty, and is the largest church in Germany. It is 485 feet in length, 200 in breadth, and 141 in height, the unfinished tower over the main entrance being 337 feet. The building was begun in 1377, and finished in 1494. There are good schools for the people, a gymnasium, high school, and trades' school, a public library, an agricultural society, and many charitable institutions. Leading industries are weaving linen, cotton, woollen, and mixed fabrics; bleaching; making paper, leather; beer-brewing; ship-building; book-printing, &c. U. is famed for ornamental pipe-bowls, and pastry called Ulmer bread. Around the city, gardening is extensively carried on, and asparagus especially cultivated.

The Romans had a settlement at this important point. In 1531, the city accepted the Reformation, and the majority of the people have since been Lutherans. In 1802, U. was attached to Bavaria, and became part of Würtemberg in 1810.

ULMA'CEÆ, a natural order of exogenous plants, regarded by some botanists as a sub-order of *Urticaceæ*. They are trees or shrubs, having rough alternate leaves, each leaf with a pair of deciduous stipules. The flowers are small and in loose clusters. The perianth is small, membranous, bell-shaped, irregular; the stamens equal in number to the lobes of the perianth, and inserted into their base; the ovary superior. The fruit is 1—2-celled, nut-like, or compressed and winged. There are about 60 known species, natives of temperate parts of the northern hemisphere. See ELM, NETTLE-TREE, and ZELKOUA.

U'LMIN. See HUMUS.

U'LNA. See ARM.

ULODE'NDRON, a singular genus of coal plants, founded on stems which occur chiefly in the roof-shales. The stems are covered with small rhomboidal scars, as in Lepidodendron, formed by the bases of leaves or scales; but they differ remarkably from that genus in having a double series of large oval or circular markings, arranged linearly on the opposite sides of the trunk. These markings are variously interpreted as representing the cicatrices produced by the bases of cones, by branches, or by leaf-stalks. It is, like many of the coal fossils, an extremely enigmatical plant; and it is difficult to determine its position in the vegetable kingdom. It is probably an ally of Lepidodendron, and that is known to be a vascular cryptogam nearly related to Lycopodium. Seven species are known.

ULPIA'NUS, DOMITIUS, a celebrated Roman jurist, of Tyrian extraction, flourished in the early part of the 3d century. The exact date of his birth, however, is unknown. He appears to have held juridical offices during the reigns of Septimius Severus and Caracalla, of which he was deprived by Elagabalus; but, on the accession of Alexander Severus (222 A. D.), he became the principal adviser of that emperor, who appointed him *scriniorum magister* (keeper of the public records), a *consiliarius* (public assessor), and *præfectus annonæ* (superintendent of the corn-market). He also held, during

he reign of Alexander Severus, the important post of prefect of the Prætorian Guards, though it is uncertain whether that monarch first conferred it upon him. He was murdered by his own soldiery, 228 A.D. U. was both a voluminous and a valuable writer. In the *Digest* of Justinian, there are no fewer than 2462 excerpts from him, many of which are of considerable length. Altogether, they form about a third of the whole body of the *Digest*. Unfortunately, the originals have almost entirely perished. The principal were—*Ad Edictum* (83 books), *Ad Sabinum* (51 books), *Ad Leges Juliam et Papiam* (20 books). The so-called *Fragmenta* of U. (first published at Paris by Tilius in 1549) consist of 29 titles, whence they are called in the Vatican MS. *Tituli ex Corpore Ulpiani*. The best edition is Böcking's (Bonn, 1836).

ULRIC, St, Bishop of Augsburg, and venerated as one of the Fathers of the German Church, was born at Augsburg about the year 890. His father, Hupald, was one of those counts of Dillingen who play so important a part in medieval German history, and U. himself owed part at least of the extraordinary influence which he exercised in his time, to the distinguished rank of his family. He was educated in the celebrated Benedictine monastery of St Gall (q. v.) in Switzerland; but his later life, and the character of his mind, as well as the tendency of his religious views, appear to have been influenced less by his monastic instructors, than by the counsels of a remarkable female recluse named Wiborada, whose cell was in the vicinity of St Gall, and with whom he formed a close association. It was by her counsel that, instead of adopting the Benedictine habit at St Gall, he devoted himself to the secular ministry, and returned to his native diocese of Augsburg, where he received holy orders. In accordance with the usage of his time, he made a pilgrimage to Rome, and soon after his return, was consecrated Bishop of Augsburg, on the death of Hiltine in the year 923. The details of his history as administrator of this church, which had suffered serious disorganisation through the Magyar invasion and other wars, would be out of place here; but they are related with much circumstantiality by his contemporary biographer; and they throw so much light as well on the externals of the religious life of the time, as on the moral and spiritual character of the people, laity as well as clergy, as to merit the most serious consideration of every student of medieval history. Bishop U. bore an important part in the public affairs of the empire during the reign of Henry I. and his son Otho; and he was the guiding spirit of the several councils in Germany which, in the 10th c., laboured at the work of reformation. He died in 973.—See the ancient *Vita S. Oudalrici Episcopi*, which is edited by Mabillon, by the Bollandists, and recently by Dr Pertz. Some letters and sermons, still extant, have been ascribed to U., but they are regarded as spurious by Mabillon and Pertz, as well as by the Bollandists.—See Braun's *Geschichte der Bischöfe von Augsburg*.

ULRICI, Hermann, a German critic, born at Pförten in Lower Lusatia, 23d March 1806, studied at Halle and Berlin, and after a brief career as a lawyer, devoted himself exclusively to literature and philosophy. In 1834, he was appointed a professor-extraordinary at Halle, a position which he continues to hold. His first work was his *Geschichte der Hellenischen Dichtkunst* (2 vols., Berl. 1835), which was followed by a very clever and ingeniously theoretical production on the dramatic art of Shakspeare (*Ueber Shakspeare's dramatische Kunst*, Halle, 1839; Eng. transl., Lond. 1846), which has, however, attracted more attention than it probably merits. Other works of U.'s are his *Ueber Princip und Methode der Hegel'schen Philosophie* (Halle, 1841); *Das Grundprincip der Philosophie* (2 vols., Leip. 1845—1846); and a *System der Logik* (Leip. 1852). As a further fruit of his Shakspearian studies may be mentioned his edition of *Romeo and Juliet* (Leip. 1853). In 1862 he published *Gott und die Natur*.

U'LSTER (Lat. *Ultonia*), a province of Ireland, the most northern of the four into which that kingdom is divided. See Ireland. It is divided into nine counties, Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone, each of which is described under its proper head.

The territorial distribution by which U. is constituted a province, or at least a distinct territory, is of very ancient origin. It formed one of the five ancient divisions of Ireland, and was the seat of the Hy-Nialls or O'Neills, as well as of the less distinguished septs of O'Donnell, O'Cahan, O'Doherty, Maguire, MacMahon, &c. The north-eastern portion, the present county of Down, was, early after the invasion, overrun by the English under De Courcy, and was subsequently held by Hugh de Lacy. This was the most permanent seat of English power in Ireland during the early period. The coast of Antrim was occupied by a colony of kindred Celtic race from Scotland and the Isles; but although various efforts were made by the English to effect a permanent settlement in the north and north-west, their success was little more than nominal until the reigns of Elizabeth and James I., when the well known Plantation of U. was attempted. Of this gigantic scheme of enforced colonisation, the chief seat was the county of Londonderry (q. v.). In U., the Celtic race, owing to the frequent and large infusions of a foreign element from England and Scotland, is found in a much smaller proportion. In 1861, the Roman Catholics were slightly in excess of the total of all other denominations, but these proportions, owing to ten years' emigration, are reversed in 1871. Of the total population of 1,830,398 in the latter year, the Protestants of all denominations made up 935,923, the Roman Catholics only 894,525. Of the former, 484,425 were Presbyterians, and 398,705 Episcopalians. Pop. in 1881, 1,743,075.

ULSTER BADGE. On the institution of the order of Baronets in England by James I., a sinister hand, erect, open, and couped at the wrist gules, the armorial ensign of the province of Ulster, was made their distinguishing badge, in respect of the order having been intended for the encouragement of plantations in the province of Ulster. This badge is sometimes borne in a canton, sometimes on an escutcheon, the latter placed either in the fess point or in the middle chief point, so as to interfere as little as possible with the charges of the shield.

ULSTER KING-OF-ARMS, the king-of-arms or chief heraldic officer of Ireland. A king-of-arms called Ireland existed in the time of Richard II., but the office seems to have fallen into abeyance in the following century. Ulster was created to supply his place by letters-patent of Edward VI. in 1552. Ulster holds his appointment from the crown, and acts under the immediate direction of the Lord-lieutenant of Ireland. His office is in the Record Tower of Dublin Castle; and the professional staff under him consists of two heralds, four pursuivants, one registrar, and one clerk of records. The records of Ulster's office comprise pedigrees of the nobility and gentry of Ireland, certificates of their deaths and funerals, and grants of arms. The official arms of Ulster King-of-arms are: Argent, St George's

cross gules, on a chief of the last a lion passant gardant between a harp and a portcullis or.

ULTIMA'TUM, in Diplomacy, the final conditions or terms offered by one government for the settlement of its disputes with another: the most favourable terms which a negotiator is prepared to offer, whose rejection will generally be considered to put an end to negotiation.

U'LTIMUS HÆ'RES, in the Law of Scotland, means the crown, which is the last heir after all the kin have become exhausted, and succeeds to the property of those who die without leaving next of kin, or who, being bastards, have no next of kin.

ULTRAMARI'NE, a beautiful blue pigment, formerly obtained only from the very valuable mineral, lapis-lazuli; but an artificial kind is now made so cheaply, and is so good, that it is generally used instead. The true ultramarine, from its costly nature, was only used by artists; the artificial sort is, however, extensively used by house and ship painters, and is as cheap as it is beautiful. Many artists still insist upon having the former kind, which is prepared as follows: Fine lapis-lazuli is broken up into very small pieces, so as to enable the operator to see and pick out the small white portions which occur in it. Of the pieces of pure blue which remain, a pound-weight is then taken, and in a carefully covered crucible, is heated to redness, and then thrown into cold water. It is next reduced to an impalpable powder, and mixed with six ounces of finely powdered resin, as light in colour as it can be obtained, and two ounces each of spirits of turpentine, bees-wax, and linseed oil, all previously melted together. When these ingredients are thoroughly worked into a mass, portions of it are taken and kneaded in clean water; as long as any blue colour is given out, this is continued, until every portion has been so treated. The blue water is then allowed to rest, and the sediment is collected and washed in water several times. The first washing removes a considerable quantity of dirt and other foreign matters, and is consequently rejected. The second, after being well agitated, is decanted; and from it is obtained the highest quality of the pigment. That which remains, usually has two other washings, each of which gives a product of a less value than the operation which preceded it. The product obtained by sediment from each of the waters used, is carefully dried, and is then employed either to make cakes for water-colour painting, or a mixture for oil-painting, the value being about £1 per ounce. ARTIFICIAL ULTRAMARINE.—The French chemists Clement and Desormes, in studying the curious process of obtaining ultramarine from lapis-lazuli by mixing it with resin, &c., were led to an analysis of the colouring matter that suggested to Guimet the idea of composing it artificially. In this he succeeded, and obtained for his discovery the prize of 6000 francs offered by the *Société d'Encouragement des Arts*. Almost simultaneously, Gmelin in Tübingen gave an analysis and a synthetic process which also succeeded, and artificial ultramarine is now a regular article of manufacture. Chemical skill, however, is necessary to success, and the manufacturers' formulas are very various —differing in the quantities of the ingredients, and the order of mixing them. The German manufacturers are very successful, and some of them have recently produced a fine green ultramarine. The following formula, which is recommended by Professor Miller, is one of the simplest: 100 parts of finely-washed kaolin or porcelain clay (silicate of alumina), 100 of carbonate of soda, 60 of sulphur, and 12 of charcoal, are mixed and exposed in a covered crucible to a bright heat for three hours and a half, when a green, unfused residue should be left. This residue, after being well washed and dried, must be mixed with a fifth of its weight of sulphur, and exposed in a thin layer to a gentle heat, so as just to burn off the sulphur. When this is accomplished, more sulphur must be added, and the washing repeated; and so on, until the mass acquires a light blue colour, which is usually the case after the third roasting. There is reason to believe, from the experiments of Wilkens, that ultramarine is composed of two portions—one of which is constant in its composition, and is the essential colouring matter, containing about 40 of silicic acid, 26 of alumina, 13 of sulphur, and 21 of soda, arranged as a mixture of two silicates of alumina, sulphite of soda, and sulphide of sodium—the blue colouring principle being a compound of the two latter; while the other portion differs from the former in resisting the action of hydrochloric acid, and contains a variable amount of sand, clay, oxide of iron, and sulphuric acid. Ultramarine, if heated in the air, gradually assumes a dull green tint; and it is quickly decomposed by the action of the mineral acids and chlorine.

The term *Yellow Ultramarine* is sometimes given commercially to chromate of baryta, a yellow insoluble powder used as a pigment.

ULTRAMO'NTANE (Lat. beyond the mountains—the Alps—namely, in relation to France), that party in the Church of Rome which assigns the greatest weight to the papal prerogative. The pope, according to the U. doctrine, is superior to general councils, and independent of their decrees; he is considered to be the source of all jurisdiction in the church; and it is through him, and not directly in virtue of their episcopal office, that the bishops derive their powers of 'jurisdiction,' as distinguished from those of 'order.' See ORDERS. The U. school has been the opponent of those doctrines and views which favour the right of self-government by national churches. The school opposed to the U. is called the Gallican. See GALLICAN CHURCH.

ULUGH-BEG, the grandson of Timûr (q. v.), governed Western Turkestan as regent for his father Shah Rokh, while the latter was employed in regulating the affairs of the southern half of the empire, and succeeded, in 1447, to the imperial throne on his father's death. He was a successful warrior, as was of necessity every ruler of this period; but happening, unfortunately, to conceive suspicions of the loyalty of his eldest son, suspicions founded only upon astrological indications, the offended and injured prince rebelled, defeated and captured his father, and soon after caused him to be put to death, thus fulfilling the prediction, 1449 A. D.

U. is known to posterity as the founder of the observatory at Samarkand, as the liberal patron of astronomers, and as himself a most diligent observer. The astronomical tables which bear his name, in all probability compiled by himself and his two fellow-labourers, Salah-ed-din Cadizadeh al Roumi and Gaiathed-din Mohammed Jerusheid al Coushgi, enjoy a high reputation for accuracy, considering the time when they were compiled, and the means of observation in the hands of astronomers. The astronomical works of U. were written in Arabic, afterwards translated into Persian, and thence the chronological portion of them rendered into Latin (Lond. 1650), by Greaves, who followed with a Latin version of the geographical part in 1652. An independent version of the same work in Latin and Persian was published by Dr Thomas Hyde, at

Oxford, in 1665. A new edition of U.'s catalogue of stars will be found in the *Memoirs of the Royal Astronomical Society*, vol. xiii.

ULULA'TION (Lat. howling). It sometimes happens that articulate sounds or cries resembling, perhaps imitative of those of animals, or mere shrieking and howling, form the sole or chief symptom and characteristic of a morbid mental state. The act is automatic, and may be regarded as indicative of grave changes in the physical and moral nature. In the middle ages, during great religious excitement, and those mental epidemics which involved large communities, such phenomena appear to have been of frequent occurrence. It appears that in the 18th c., a family of five sisters, in the county of Oxford, were affected with a modification of hysteria, during which they howled or barked like a dog; and that, about the same period, a large religious community of females in France, one and all, and at the same hours, shrieked or mewed like cats; and were only reduced to sobriety and to silence by the presence of military.—Laycock on *Nervous Diseases of Females*, p. 286; Calmeil, *De la Folie considérée sous le point de Vue Pathologique, Philosophique, Historique, et Judiciaire*, t. ii. p. 310.

U'LVA. See LAVER.

U'LVERSTON, a small but important market-town and seaport of Lancashire, in the district of Furness, 22 miles by railway north-west of Lancaster. It stands in an extensive agricultural and mining district, and is the centre of commerce for Furness, and for parts of Cumberland and Westmoreland. It contains cotton and paper mills, and carries on manufactures of linen, ropes, and woollen yarn, and has a coasting-trade in iron and copper ores, limestones, grain, and gunpowder. Pop. (1861) 6630; (1871) 7607; (1881) 10,001.

ULY'SSES, ULYXES, AND ULIXES, the Latin forms of the Greek ODYSSEUS, i.e., the 'Angry,' the name of one of the most celebrated heroes of the Trojan war. Different accounts are given of his parentage; but according to the oldest legend, the Homeric, he was the son of Laertes, Prince of Ithaca (one of the Ionian Isles), and of Anticleia, daughter of Autolycus. According to a later account, his father was the crafty Lisyphus; whence he is sometimes called, by way of reproach, Lisyphides. He married Penelope (q. v.), by whom he became the father of Telemachus. While still a youth, he had acquired a reputation for courage, eloquence, and address. When the expedition against Troy was resolved on, Agamemnon visited Ithaca, and prevailed on U., though with difficulty, to take part in it. Later traditions, or, as in this case, perhaps we ought to call them *inventions*, go on to exaggerate the reluctance of U. to leave his home, and represent him as feigning madness—an artifice which did not, however, succeed. Before hostilities broke out, U., in conjunction with Menelaus and Palamedes, was sent to Troy, with the view of persuading the Trojans to give up Helen and her treasures; but this little bit of diplomacy having failed, the Greek princes assembled their fleets in the port of Aulis, and sailed for Troy, U. bringing with him twelve ships. During the siege, U. performed important services for the Greeks. In prudence, ingenuity of resource, and *finesse*, he was the foremost of the Hellenic chiefs, while in courage he was inferior to none. After the fall of Troy, the most interesting part of U.'s career begins, and forms the subject of the Homeric poem called the *Odyssey*. Several of his adventures are manifestly of eastern origin, and closely resemble those of *Sinbad the Sailor*. Setting sail for home, his ships were driven by a storm on the coast of Thrace, where he plundered the town of Ismarus, but lost a number of his crew. Having re-embarked, a north wind blew them across the Ægean and the Levant, to the country of the Lotophagi (the 'Lotus-eaters'), on the coasts of Libya, where the companions of U. ate of the wondrous fruit, and wished to rest for ever. (Our readers will remember Tennyson's delicious rendering of this episode.) But their leader compelled them to leave the land 'in which it alway seemeth afternoon;' and sailing north again, they touched at the 'island of goats,' where U. left all his ships but one. Thence he proceeded westward, till he reached the 'island of the Cyclopes' (Sicily), where occurred the incident narrated under POLYPHEMUS (q. v.). The island of Æolus, and the city of the Læstrygones (a race of cannibals), whither fortune and the winds next carried the Hellenic chief, are supposed to be only names for particular parts of Sicily. Thence he sailed westward to the island of Ææa, inhabited by the sorceress Circe (q. v.). After a year's sojourn, he departed, and sailing still further west, crossed Oceanus, the 'ocean-stream,' into the country of the Cimmerians (q. v.), where darkness reigns perpetually. Here (following the advice of Circe) he descended into Hades (q. v.), and inquired at the blind seer Teiresias how he might get back to his native land. Teiresias disclosed to U. the fact of the implacable enmity of Poseidon (Neptune), on account of his having rendered Polyphemus (who was a son of Poseidon by the nymph Thoosa) blind, but encouraged him at the same time with the assurance that he would yet reach Ithaca in safety, if he would not meddle with the herds of Helios (the sun-god) in Thrinacia. U. now retraced his course, and once more visited Circe, the kindly sorceress, who forewarned him of the dangers he would yet have to encounter, and how to act. A west wind blew them past the perilous island of the Sirens (q. v.) to the coasts of Italy. In passing between Scylla and Charybdis, the monster that inhabited the first of these rocks devoured six of U.'s companions. He next came to Thrinacia, which he would fain have passed by, but his crew insisted on landing, and in spite of their oath, killed some of the cattle of Helios while U. was asleep. The anger of Zeus was kindled. When they had sailed away, a fierce storm arose, and Zeus sent forth a flash of lightning that destroyed the ship. Every one on board was drowned except U. himself, who, after many dangers, reached the island of Ogygia, the abode of the nymph Calypso, with whom he lived for eight years. After his departure (which was commanded by Zeus, who had promised to Athene that U. should one day see Ithaca again—the poet always represents him as having a longing after his native isle), Poseidon persecuted him with a storm, and cast him on the shores of Scheria, the island of the Phæacians, in a very forlorn and indescribable condition. He was, however, very kindly received by Nausicaa, daughter of King Alcinous; and having revealed his name at a feast, the monarch provided him with a ship to carry him home. U. was asleep when the vessel approached the coast of Ithaca; and the Phæacian sailors who had accompanied him bore the unconscious hero to the shore, and left him there. When he awoke, he did not at first recognise where he was; but Athene appearing, informed him, and of all that had happened to Penelope (q. v.) in his absence. Disguised as a beggar, he repaired to his own court, where he was recognised by his nurse, and, as Homer touchingly describes, by his old dog, Argus. Aided by Telemachus, and the swine-herd Cumæus, he took vengeance upon the insolent suitors of his wife, all of whom

without exception, he slew. Homer records nothing more of U.'s history; but he makes Teiresias prophesy, in the 11th book, that the hero would meet a painless death in a happy old age. Another tradition says that he was slain by Telegonus, his son by Circe. Later poets, e. g., Virgil and Ovid, represent U. as a much less noble and valiant character than he appears in Homer; his wisdom and subtlety are changed into cunning and deceit; and instead of heroic courage, he displays the spirit of a coward.

UM is a Kaffir or Zulu word signifying river, and is used as prefix in the names of most of the rivers on the south-east coast of Africa, from the Great Kei, where the names of Hottentot origin appear to cease, as far to the north-east nearly as the Sofala coast, where the names Imhambane, Imhampoora, have the same prefix in a corrupted shape. Amongst the principal rivers on this coast bearing this prefix may be mentioned the Umgazi, Umbashee, Umtata, Umzimvoobo, and Umzimculu, draining Independent Kaffraria; the Umcomanzi and Umtugela, in the colony of Natal; and the Umfolusi, Umhlatoozi, and Umapoota, between Natal and Delagoa Bay. The Hottentot word Kei has the same meaning, and is still preserved in the Kei and Keiskamma rivers, the Keriega, Keisuga, and other streams on the east coast of the Cape Colony.

UMÂ is, in the epic and Purânic mythology of India (see *Religion*, under INDIA), one of the principal names of the consort of the god S'iva. Other names by which she is also usually designated are *Durgâ*, *Devî*, *Kâlî*, *Pârvatî*, *Bhavânî*, while there are many more belonging to her which are of less frequent occurrence, as *Kâtyâyanî*, *Ambikâ*, *Haimavatî*, *S'ivâ*, &c. As S'iva is not yet a deity of the Vedic period of India, such of these names as are met with in Vedic writings have there a different import from that assigned to them by the later mythology. Thus, *Ambikâ* is, in the Yajurveda, a sister of *Rudra* (q. v.); *Kâlî*, a word which occurs in the Mun'd'aka Upanishad (q. v.), is there the name of one of the seven flickering tongues of Agni, the god of fire; *Durgâ*, in a hymn of the Taittirîya Âran'yaka, is an epithet of the sacrificial flame; and *Umâ*, when mentioned in one recension of the same Âran'yaka (see VEDA and UPANISHAD), and in the Kena Upanishad, means the Brahma-science, or the knowledge of what is the nature of Brahman, the Supreme Soul; and in this sense she is identified in the Taittirîya Âran'yaka with Ambikâ. But since Rudra is in later mythology a name of *S'iva*, and the Vedic Rudra is a form of Agni, the fire, more especially of the fire of the sun; and since Umâ, in the Kena Upanishad probably designates the power of Sûrya, the sun, it becomes intelligible that S'iva (q. v.), who, at a later period of Hindu religion, is both the type of destruction and contemplation, had then associated with him deities which originally represented the energy of the fire and the power or wisdom of the sun, and that those deities were afterwards held to be merely different forms or names of one and the same deity, viz., his female energy (see S'ÂKTAS), or wife. Though this double character of the consort of S'iva is not always discernible in the myths which are connected with special designations of hers, and though at a late period the popular creed looked upon her far more as the type of destruction than as that of divine wisdom, yet the works devoted to her praise never fail to extol her also as the personification of the highest knowledge. Thus, in the *Devîmâhâtmya*, the Rishi Mârkan'd'eya, in reply to a question of King Suratha, says: 'By Devî, this whole universe, with what is movable and immovable, has been created, and, when propitious, she who bestows blessings leads men to their eternal bliss; for she, the eternal goddess, is the highest wisdom, the cause of eternal bliss, and also the cause of bondage for this world, she who lords over the Lord of the universe.' And in another passage of the same work, she is invoked thus: 'O Devî, thou art the seed of the universe, the highest Mâyâ (q. v.); all this world is bewildered, but, descending on earth, thou art the cause of its final liberation: all the sciences are merely different modes of thyself.' Similarly, also, in the *Mahâbhârata* (q. v.), Arjuna says to her: 'Of sciences thou art the Brahma-science,' &c.; and in the *Harivans'a*, Vishn'u addresses her as Saraswatî, the goddess of eloquence, as Smriti, tradition, and, of sciences, as the Brahma-science, &c.

The myths relating to this goddess, who is worshipped in various parts of India—particularly, however, in Bengal (see S'ÂKTAS)—are met with in the great epic poems and Purân'as, in poetical works, such as the *Kumârasambhava* (see KÂLIDÂSA), and in modern popular compositions; but the text-book of her worshippers is the *Devîmâhâtmya*, or 'the majesty of Devî'—a celebrated portion of the *Mârkan'd'eya Purân'a*, and considered to be of especial holiness by the worshippers of this goddess. In the *Râmâyan'a* (q. v.), she is spoken of as the daughter of Mount Himâlaya (her names *Pârvatî*, *Haimavatî*, *Adrijâ*, *Girijâ*, and similar ones, mean 'the mountainous or the mountain-born'), and of the nymph Menâ, whose elder daughter, however, was the Ganges. According to the Vishn'u- and other Purân'as, she was in a former life *Satî*, the daughter of Daksha, who abandoned her corporeal existence in consequence of having been slighted by her father when he performed a great sacrifice, and did not invite S'iva to share in it; but it was only as Umâ that she bore children to her husband, viz., *Ganes'a*, the god of wisdom, and *Kârttikeya* (q. v.), the god of war. According to the *Harivans'a*, she was, in another life, born as the daughter of Yas'odâ, and exchanged for *Vishn'u*, when in his incarnation as *Kr'ishn'a*, he was born as a son of Devakî. See VISHN'U. On that occasion, she was killed by *Kansa* (q. v.); but as soon as he had dashed her to the ground, she rose to the sky, leaving behind her corporeal frame, and became a divine virgin, to whom the gods addressed their praises. Hence her names, *Kanyâ*, *Kumârî*, &c., the virgin. This connection between the legendary history of Umâ and Vishn'u is also briefly referred to in the *Devîmâhâtmya*, though this work is chiefly concerned in the narrative of the martial feats of the goddess. The latter consisted in the destruction by her of two demons, *Madhu* and *Kait'abha*, who had endangered the existence of the god Brahman; and of the demon *Mahisha*, or *Mahishâsura*, who, having conquered all the gods, had expelled them from heaven, and who met Devî, assisted only by her lion, with a numberless host of demons; moreover, in her defeating the army of *Chan'd'a* and *Mun'd'a*, two demon-servants of S'umbha and Nis'umbha; in her killing the demon *Raktavîja*, who had a sort of charmed life, each drop of his blood, when shed, producing hundreds of demons like himself; and ultimately, in her destroying the demons *S'umbha* and *Nis'umbha* themselves. In commemoration of her victory over Mahishâsura, a festival called the *Durgâpûjâ*, or *Durgotsava*, is annually celebrated in Bengal. 'The goddess,' the Rev. Mr Banerjea relates in his introduction to the *Mârkan'd'eya Purân'a*, 'is there represented with ten arms, trampling upon the demon, who is also attacked by her lion, and wounded in the chest by her spear. She has also laid hold of him by the hair, and is about to chop off his head. The most popular commemoration of

this event takes place in the autumn, about the time of the equinox; and if the practice may be supposed to be 800 or 1000 years old, it is not inconceivable that it was originally fixed at the equinox, though the precession has since made it a few days later. The calculation of the day depends, however, on a certain lunar day; but it can never be earlier than the seventh of As'win, which is about the time of our present equinox; nor can it be more than a month later than that date. The idea of the possible connection of the *Durgâpûjâ* with the equinox, is suggested by the fact, that there is a corresponding festival about the time of the vernal equinox too, in which, though it is not so popular as the autumnal *pûjâ*, the same group of figures is constructed, and the image of the goddess is in the same attitude, with the same attendance, and the same enemy.' (For a somewhat more detailed account of this festival, see Moor's *Hindu Pantheon*, p. 156.) Three weeks after the *Durgâpûjâ*, another festival in honour of this goddess, called the *Kâlîpûjâ*, takes place, to commemorate her victory over *Chan'd'a* and *Mun'd'a*. 'The sable goddess,' Mr Banerjea says, 'is represented

Kali (after the figure in Coleman's *Mythology of the Hindus*).

holding the severed head of Chan'd'a in her hand, with the heads of his soldiers formed into a garland suspended from her neck, and their hands wreathed into a covering round her loins—the only covering she has in the image constructed for the *pûjâ*. The worship of *Kâlî* (i. e., the Black), to which the narrative (of her victory over Chan'd'a and Mun'd'a) has given rise, is considered by the Hindus themselves as embodying the principle of *tamas*, or darkness. She is represented as delighting in the slaughter of her foes, though capable of kindlier feelings to her friends. She is, however, styled the Black Goddess of Terror, frequenting cemeteries, and presiding over terrible sprites, fond of bloody sacrifices; and her worship taking place in the darkest night of the month.' (For this worship, see also the article THUG.) With S'iva, she resides on Mount *Kailâsa*, the northern peak of the Himâlaya, or in her own palace on the Vindhya mountain, where she amuses herself with hunting. Her representations are numerous and various. Sometimes she is seen riding on a bull, with a trident in her hand, a serpent as bracelet, and a half-moon on her forehead; sometimes, when in the act of fighting Mahishâsura, she rides on her lion (*Manastâla*), the latter standing between the frontal bones of her elephant. Or, as *Bhadra-Kâlî*, she is represented 'eight-handed, two of her hands being empty, pointing upward and downward, one of her right hands holding something like a caduceus, its corresponding left hand, a cup; the next right and left hands, a crooked sword, and a shield with an embossed flower or fruit; the superior right hand, an agricultural implement; and the left, the noose to strangle victims with [see THUG]. Her person is richly dressed and ornamented; between her full breasts, a five-headed serpent uprears itself; she has a necklace of human heads; her ear-drops are elephants; and a row of snake-heads peeps over her coronet. Her forehead is marked either with S'iva's third eye, or her own symbol; and her open mouth shews her teeth and tusks, giving her a fierce and threatening aspect.' See Moor's *Hindu Pantheon*, where, besides, other descriptions of images of this goddess are given.—For the myths relating to her, see John Muir's excellent work, the *Original Sanskrit Texts*, vol. iv. (Lond. 1863); the *Harivans'a*, translated by A. Langlois (Paris, 1834—1835); and the *Mârkan'd'eya Purân'a*, in the *Bibliotheca Indica*, edited, with an elaborate Preface, by the Rev. K. M. Banerjea (Calcutta, 1862).

U'MBEL. See UMBELLIFERÆ.

UMBELLI'FERÆ (*Apiaceæ* of Lindley), a large and important natural order of exogenous plants, containing more than 1000 species, abounding chiefly in the temperate regions of the northern hemisphere. A peculiar regularity distinguishes the inflorescence of most of this order; a number of stalks, radiating from a common centre at the top of the stem, or of a branch, each of which bears a flower at its extremity, thus forming what is called an *umbel*. The umbel is often compound, the primary stalks dividing in a radiated manner, and forming *secondary umbels* or *umbellules*. The flowers are generally small, although the umbel which they compose is often large. They are generally white, rarely yellow, still more rarely red, though frequently tinged with pink at the edges; have a 5-toothed calyx, often obsolete, or nearly so; a corolla of five petals, inserted in the top of the calyx, and alternating with its teeth, five stamens, an inferior germen, and two styles. The fruit is very peculiar, and consists of two one-seeded, unopening carpels, rarely fleshy, touching one another on the inner side, and there attached to a little column (the *carpophore*), their common axis. Each carpel has five primary and four secondary longitudinal ridges, more or less

distinct; and beneath the separating furrows there are often linear receptacles of essential oil, called *vittæ.* The U. are mostly herbaceous plants, rarely shrubby. They generally have divided or compound, rarely simple leaves. They generally abound in a resinous secretion, and a volatile oil, from which many of them derive poisonous and medicinal properties, which are more or less common to all parts of the plant, and often highly developed in the seeds. Acridity is their general characteristic. Some are pleasantly aromatic, others have a powerful and disagreeable smell. In the roots of some, especially when enlarged by cultivation, starch and sugar are secreted, so that they become useful for food, although the peculiar flavour of the essential oil is still retained. The systematic arrangement of the U. has been found difficult by botanists. Sprengel, De Candolle, Koch, and others, have devoted much attention to this order. Of esculent-rooted U., the carrot and parsnip are the best known examples. Skirret, earth-nut, and arracacha are also of some value. The roots of *Anesorhiza Capensis* and *Fœniculum Capense* are used as esculents at the Cape of Good Hope. The roots of *Chærophyllum tuberosum*, or SHAM, are used in the Himalaya. The herbage of *Prangos pabularia* is so bland that it is much used in the temperate parts of the East Indies for feeding cattle, and made into hay for winter fodder. It is said, however, to be injurious to horses, although oxen and sheep are rapidly fattened by it. The blanched stems of celery, enlarged by cultivation, are a favourite salad, and those of Alexanders (*Smyrnium olusatrum*) were formerly used in the same way. The candied stalks of eryngo were once much esteemed, and those of angelica are still used. The leaves of parsley, chervil, fennel, &c., are used for flavouring. Lovage (*Levisticum officinale*) is sometimes cultivated as a salad plant. The seeds of anise, caraway, coriander, &c., are used as carminatives. Hemlock, water hemlock, water parsnip, fool's parsley, and many others, are narcotic poisons—asafœtida, galbanum, sagapenum, and opoponax are medicinal products of this order.

U'MBER (*Scopus umbretta*), an African bird of the family *Ardeidæ*, allied to the storks, but having a compressed bill with sharp ridge, the tip of the

Umber (*Scopus umbretta*).

upper mandible hooked, and the nostrils situated in a furrow which extends all the length of the bill. It is about the size of a crow, with umber-coloured plumage, and the male has a large crest on the back of the head.

UMBER, a mineral used as a pigment, a variety of the iron ore called Hæmatite (q. v.), and consisting chiefly of oxide of iron, with some oxide of manganese, silica, alumina, and water. It is soft and earthy, of a dark brown colour, and has a conchoidal fracture. It readily imbibes water, and falls to pieces like newly-burnt lime. It is found in Cyprus in beds. When roasted, it becomes reddish brown in colour, and in that state is also used as an artist's colour.

UMBI'LICAL CORD, or NAVEL STRING the bond of communication between the fœtus (which it enters at the umbilicus, or navel) and the placenta, which is attached to the inner surface of the maternal womb. It consists of the umbilical vein lying in the centre, and the two umbilical arteries winding from left to right round the vein. Contrary to the usual course, the vein conveys arterial blood to the fœtus, and the arteries return venous blood to the placenta. These vessels are embedded in a yellow gelatinous matter, known from its first describer (in 1659) as Wharton's gelatine. Nervous filaments have been traced into the cord; but the presence of lymphatics is doubtful. The whole is invested by a membrane (the amnion), and its ordinary length is about 20 inches. As soon as a child is born, and its respiration fairly established, the umbilical cord is tied, and divided near the navel, which spontaneously closes, the fragment of attached cord dying away. See the articles FŒTUS (in which there is a figure of the umbilical cord) and PLACENTA.

UMBILICAL CORD, in Botany, the connecting link between the placenta of the ovary and the ovule, through which pass the vessels which nourish the ovule till it ripens into the seed. In some plants, the ovules are so closely connected with the placenta, that no umbilical cord can be said to exist; in others, it is of considerable length.

UMBILICAL HERNIA is the term applied to the protrusion of intestine at the navel or umbilicus. It is, for obvious anatomical reasons, of most frequent occurrence shortly after birth; but it is not uncommon in women who have been frequently pregnant. If the hernia is reducible, and the patient an infant, the ordinary course of treatment is, after returning the parts to their proper position, to place the convex surface of an ivory hemisphere on the navel, and to retain it there either with strips of adhesive plaster, or with a bandage. Special trusses are made for the treatment of this affection in adults. In cases of irreducible hernia, a large hollow pad should be worn. If it becomes strangulated, an operation may become necessary.

UMBI'LICUS is the anatomical term for the navel.

UMBRE'LLA (Lat. *umbra*, a shade). As a shade from the sun, the umbrella is of great antiquity. In the sculptures of Egypt, Nineveh, and Persepolis, umbrellas are frequently figured, closely resembling the chaise umbrella of the present day. In the East, however, its use seems to have been confined to royalty; but in Greece and Rome it was more extensive. The custom was probably continued in Italy from ancient times; but at the beginning of the 17th c. the invention seems to have been little if at all known in England. In that century, however, it came into use as a luxurious sun-shade; and in the reign of Queen Anne it had become common in London as a screen from the rain, but only for the weaker sex. The first person of the male sex who had the moral courage to carry an umbrella in the streets of London was Jonas Hanway, the founder of the Magdalene Hospital, who was newly returned from Persia,

and in delicate health. Still, it was long regarded as a sign of infirmity or effeminacy to use them, and those who did so suffered much unpleasant jeering in consequence. They were at first all brought from abroad, chiefly from India, Spain, and France; now the manufacture of umbrellas has reached an enormous extent in Great Britain—the exports alone amounting to the value of £200,000; whilst, instead of effeminacy, it is considered now a sign of poverty or improvidence not to be possessed of one.

U′MBRIA, one of the ancient divisions of Italy, west of Etruria, and north of the country of the Sabines. It is usually described as extending from the Tiber eastward to the Adriatic; but while this was probably the case in pre-historic times, it was not so during any part of the period of which we have authentic knowledge. Tradition, indeed, leads us to believe that at one time the Umbrian territory extended from sea to sea, embracing much, if not the whole, of the country subsequently occupied by the Etruscans; but when the Umbrians first come before us as a distinct people, we find them restricted to the ridges of the Apennines, the lowland region bordering on the Adriatic from the Æsis (mod. *Esino*) to the Rubicon, being held by a race of Gallic invaders, known as the Senones. The most notable towns of U. were Narnia, Interamna, Acriculum, Spoletium, Mevania, Fulginium, Assisium Tifernum, Nuceria, Camerinum, Sentinum, Urbinum, Sena Gallica, Fanum Fortunæ, and Ariminum.

The Umbrians were considered in ancient times to be the oldest people of Italy, and were, in consequence, vaguely spoken of as 'aborigines;' but neither the knowledge of the ancients, nor the methods of investigation which they pursued, allowed them to arrive at any trustworthy ethnological results. Modern researches into their language (of which we possess one important memorial in the tables of Iguvium; see EUGUBINE TABLES) have demonstrated that they spoke a tongue closely allied to the Oscan (see OSCI), and were therefore, in all probability, members of the Latino-Italian race. These researches further tend to confirm the tradition of their great antiquity, for an analysis of the structure of the Umbrian language proves it to be the oldest of the Italian dialects.

The Umbrians make their first authentic appearance in the wars between the Romans and the Etruscans. They would seem to have been destitute of any political organisation or unity, for we find that some of their tribes took part with the Romans, and others—probably the majority—with the Etruscans. At anyrate, they were subjugated along with the latter people; and we do not read of them again until the third Samnite war, when, in conjunction with the Etruscans and Gauls, they joined the Samnites in their last gallant struggle against the imperious supremacy of Rome (q. v.). The confederacy was utterly vanquished in the great battle of Sentinum (295 B.C.), and the Umbrians were again reduced to submission. The establishment of Roman colonies in the *Gallicus Ager*, or territory of the Senonian Gauls, seems to have completely overawed, and gradually even to have Romanised them. They stood faithfully by Rome in the dark years of the Hannibalic war, and were among the first to furnish Scipio with volunteers for the invasion of Africa. In 90 B.C., they obtained the Roman franchise, and thenceforth disappear from history as a distinct people.

UMPIRE is a third arbitrator appointed by two arbitrators in the event of their differing in opinion; and when the reference or arbitration has devolved upon the umpire, his award or umpirage becomes final and binding on the parties.

UNALA′SHKA, an island belonging to the United States in the North Pacific, one of the Fox Islands, in lat. 55° 52′ N., and 166° 32′ W. It is 75 miles long, and in some parts 20 miles broad, has a rugged mountainous surface, and is thinly peopled. Ships are here supplied with all necessaries except wood.

UNCA′RIA. See GAMBIR.

U′NCIAL LETTERS—so called as being an inch (Lat. *uncia*) long—characters of a large and round form, used in some ancient MSS. The earliest form of an alphabet is its capitals, and the oldest Greek and Latin MSS. are written entirely in capitals. Uncial letters, which began to take the place of capitals in the middle of the 5th c., differ from them in being composed of rounded, and not straight lines, and exhibiting a tendency towards greater expedition in style. Uncial writing arose as writing on papyrus or vellum became common, the necessity for more rapid execution leading to the practice of curving the lines. Its being more easily learned than the cursive style, was probably the cause of its becoming the favourite mode of writing books of importance among the monkish scribes; while legal instruments, which required greater dispatch, were executed by professional scribes in a corrupted form of the Roman cursive hand. Uncial writing prevailed from the 6th to the 8th, or even 10th century. The following specimens of uncial Greek and Latin writing are from a MS. of the four Gospels and Acts of the Apostles in both languages, written early in the 6th c., and presented to the university of Cambridge by Theodore Beza in 1581. The passage is from John xxi. 19—'signifying by what death he should glorify God.'

Greek.

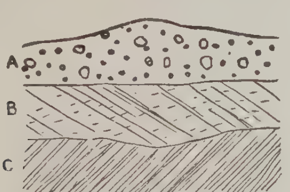
Latin.

During the 6th and 7th centuries, a transitional style of writing prevailed in Italy, and to some extent elsewhere, in which the letters approximated more nearly to the Roman cursive hand: this passed by a gradual transition into the *minuscule* manner, or small hand, which, from the beginning of the 10th c., became usual in MSS.—See Silvestre's *Universal Palæography*, translated and edited by Sir F. Madden (Lond. 1850); *Traité de Diplomatique*, par deux Religieux Benedictins de la Congrégation de St Maur (Par. 1755).

UNCLEA′NNESS, in the Old Testament, betokens a state of bodily infirmity which, for the time being, excluded the sufferer from the 'holy community,' and which, by the various ceremonies connected with the gradual recovery from this exceptional state, went far to impress the people with the constantly reiterated connection between them and God, and their own destination of being 'a holy people.' No less did the strict cleanliness enforced by the constant fear of becoming an 'outcast' for however brief a period, and the strict

supervision exercised by the priests, to whom the sanitary well-being was to a certain extent intrusted, act in a salutary manner. Birth, death, the different sexual functions and infirmities, were all, in different manner, causes of uncleanness, and treated according to their different degrees. To a certain extent, some incongruous admixtures of plants, animals, even materials in one garment, &c., may also be reckoned among things that 'defiled' or gave rise to a certain uncleanness. Fruits of a tree during its first three years were not to be eaten, as 'uncircumcised' or unclean. About the special ways in which uncleanness was treated, we have spoken under PURIFICATION, where also the similarity that has been found between the Jewish laws on these points and those of the Persians and Indians, is touched upon. The uncleanness of the leper is specially treated under LEPROSY.

UNCONFO'RMABLE STRATA are strata which rest on the more or less inclined edges of older beds. The existence of unconformability in a series of strata is an indication of an interval sufficiently long to permit of the consolidation, disturbance, and upheaval, denudation, and subsequent depression of the inferior beds. No indication of the period that has intervened is to be found in the unconformability itself; but some idea of it may be obtained by an examination of the strata that are known to have been deposited subsequent to the inferior rocks, and previous to the overlying unconformable deposits. Thus, in the north of Annandale, the Silurian basement rocks, which have often an almost perpendicular dip, are covered by Permian sandstone, and this, again, by the boulder-clay, or alluvial deposits. The first break in the strata represents the time during



Diagrammatic Section of Strata near Moffat:
A, Boulder clay, or alluvial deposits; B, Permian sandstone; C, Silurian rocks.

which the Devonian and Carboniferous rocks were deposited, when, in all probability, the Silurian strata formed a dry land surface, and supplied some of the materials for these rocks. The second break is all the indication in that district of the lengthened period during which the whole of the Secondary and Tertiary strata were being deposited elsewhere. The temporal value of the break is not so easily determined, in the majority of cases. It is only in one place in Britain, in a cutting in the St Helen's Railway near Ormskirk, where any apparent unconformability exists between the Bunter and Keuper strata, and even there it is so slight that it was long overlooked; yet this break represents a gap which on the continent is filled by the important sets of strata, the Muschelkalk and St Cassian beds, containing two great assemblages of fossils perfectly distinct from each other. Very frequently, however, no beds are known which fill up the gap between the two unconformable series. Professor Ramsay has shewn that in the Palæozoic epoch between the Laurentian gneiss and the Permian beds there are ten breaks. Each of these is accompanied by a sudden and remarkable change of fossils, sometimes in the genera, and always in the species. Professor Ramsay believes these gaps represent a *much greater* interval of time than that to which all the existing Palæozoic formations of Great Britain bear witness. Such blanks in the stony records of the world's history are as frequent in the Secondary and Tertiary epochs as in the Palæozoic.

The not taking into account the existence of unconformable stratification, has frequently caused a useless expenditure of money in searching for minerals. It seemed natural to expect that the Permian rocks of Upper Annandale covered beds of the true Coal-measures, but an examination of the numerous natural sections where the base of the Permian sandstone is seen, shews that it rests on the Silurian rocks; and the necessarily abortive attempts that have been made to reach coal through the Red Sandstone have been simply a useless throwing away of money.

UNCTION (Lat. *unctio*, an anointing, from *ungo*, I anoint), the practice of anointing the body, or certain portions of the body, with oil, especially with the oil of olives. It was resorted to by the ancients from motives of health (see OILS), of athletic development, or of luxury; but the practice is noticeable here chiefly in its relations to religion. Anointing with oil seems to have been supposed to carry with it the same effects in spiritual things which it produces in the natural world. It was a rite in frequent use among the Egyptians, as well as the Greeks and Romans; and the Scriptural narrative of the ante-Mosaic religion contains distinct evidence of its use (Gen. xxviii. 18, xxxi. 13). In the Mosaic ceremonial, its use is still more frequent. Priests and kings were anointed on being set apart for their several offices; as were also sacred vessels. The oil employed in these religious unctions was prepared of the most precious perfumes and balsams, and Ezekiel rebukes the Jews (xxiii. 41) for making a similar unguent for their personal uses. The special significance of the rite of unction may be inferred from the circumstance that the popular name of the expected Messiah was the Christos, i. e., the Anointed. In Christian use, anointing from a very early time possessed the same sacred significance. See EXTREME UNCTION. Besides the anointing of the sick, however, there are many other sacred unctions traceable in ancient Christian practice; namely, in baptism, in confirmation, in the ordination of priests and other clergy, in the consecration of churches and altars, the benediction of sacred vessels and utensils, &c. It has also been employed in the coronation of kings; and in some countries, curious traditions and legends are preserved connected with the unction of the king, or arising out of it. See RHEIMS.

UNDERGRA'DUATE, a student of a university or college who has not yet taken his first degree.

UNDI'NES (perhaps from *unda*, a wave), the name given in the fanciful system of the Paracelsists to the elementary spirits of the water. They are of the female sex. Among all the different orders of elementary spirits, they intermarry most readily with human beings, and the Undine who gives birth to a child under such a union, receives with her babe a human soul. But the man who takes an Undine to wife must be careful not to go on the water with her, or at least not to anger her while there, for in that case she will return to her original element. Should this happen, the Undine is not disposed to consider her marriage dissolved; she will rather seek to destroy her husband, should he venture on a second marriage. Baron de la Motte Fouqué has made this Paracelsist fancy the basis of an exquisite tale, entitled *Undine*.

UNDULATORY THEORY OF LIGHT. Optics ranks next to Dynamics in the category of nearly *exact* sciences—that is, of sciences whose fundamental principles are so well known, that the result of almost any new experimental combination can be predicted mathematically. Given the forces acting on a body, the Laws of Motion (q. v.) enable us, by purely mathematical processes, to determine the consequent motion. Though we have not as yet arrived at equal perfection in Optics, we are certainly far on the way, and probably have now attained nearly all the progress (independent of improvements in our mathematical methods) which will be made until the next great step in molecular physics shall give us the clue to the nature of the minute motions on which Light, Heat, Electric Currents, and Magnetism depend. The most extraordinary and almost incredible predictions of theory have been verified by experiment, and at present the differences between theory and experiment may be divided into two classes, corresponding to the above exceptions. The first are those depending on the imperfections of mathematical processes, where, because, for example, as we are yet unable to obtain the exact solution of a certain differential equation, we have to content ourselves with an approximate one. But every improvement in our means of approximation is found to introduce a closer agreement between theory and experiment. This difficulty may safely be left to mathematicians. It is otherwise with the second difficulty. This depends on our ignorance of the ultimate nature of matter, and our consequent inability to apply mathematical reasoning in a perfectly correct and sufficiently comprehensive manner. Here the experimenter's work is still required, and it is in this direction that we must in all probability now look for important extensions of our knowledge.

Optics is divided into two parts, *Physical* and *Geometrical*. Of these, the latter contents itself with assuming certain obvious experimental truths, such as the fact, that light in a uniform medium moves in straight lines, the ordinary laws of reflection and refraction, &c., and, making these its basis, employs mathematics to develop their further consequences. It is thus that theory has shewn how to carry to their utmost perfection such exquisite specimens of art as the best telescopes and microscopes of the present day. But these investigations, and their practical application, are wholly independent of the *nature* of light, and cannot be affected by discoveries in that direction.

It is otherwise when we come to Physical Optics. This commences with the question: '*What is light?*' and endeavours to deduce from the nature of light the experimental laws which, as we have seen, are assumed as the basis of Geometrical Optics.

By two perfectly distinct classes of astronomical observations—Aberration (q. v.), and the Eclipses of Jupiter's satellites—we know that light takes *time* to pass from one body to another—the velocity, however, being enormous—about 200,000 miles per second. Hence it follows, that either *Matter* (q. v.) or *Energy* (see FORCE) must be transferred from a body to the eye before we can see it. Here we have at once the rival physical theories of light, which have alternately had the advantage of one another in explaining observed phenomena. It is only of late years that an *experimentum crucis* has finally decided between them—by shewing one of them to be utterly incompatible with a result of observation.

Newton adopted the corpuscular theory, in which light is supposed to consist of material particles—i. e., he adopted the first of the two possible hypotheses; and he gave the first instance of the solution of a problem involving molecular forces, by deducing from this theory the laws of reflection and single refraction. We shall see immediately that this beautiful investigation led to the destruction of the theory from which it was deduced. But, independent of this, there are many grave and obvious objections to the corpuscular theory; for it involves essentially the supposition of material particles impinging on the eye with the astounding velocity of 200,000 miles per second! If such particles weighed but the millionth of a pound, each would have something like ten times the Momentum (q. v.), (i. e., the battering power), and *six million* times the Vis-viva (q. v.), or kinetic energy (i. e., the penetrating power), of a rifle-bullet. Suppose them a million times smaller—yet as millions of millions of them must be supposed to enter the eye at once, coming from every point of the surface of every visible object, it seems impossible to reconcile such a hypothesis with the excessive delicacy of the organs of vision.

It is not pretended by the advocates of the rival hypothesis, the Undulatory Theory of Light, that they understand exactly the nature of the transference of energy on which they suppose light to depend; but they take from the analogy of sound in air, and of waves in water, the idea of the existence in all space of a highly elastic fluid (or quasi-solid), provisionally named the *Ether* (q. v.), and they suppose light to consist in the propagation of waves in this fluid. Huyghens has the credit of having propounded, and ably developed and illustrated, this theory.

As we have seen above, no third hypothesis as to the nature of light is admissible. Many strong arguments against the truth of the corpuscular theory had been furnished by experiment, especially in the early part of the present century; and as they were always met by further and more extraordinary properties which had to be attributed to the luminous corpuscles, the theory had become complicated in the most fearful manner; and this of itself was an almost complete disproof. Still, it held its ground, for Newton's old objection to the rival theory, viz., that on the undulatory hypothesis there should be no shadows at all (witness the analogy of sounds heard round a corner), was as yet unanswered. This difficulty was overcome by Young (q. v.), to whose sagacity we are indebted for the idea of *Interference* (q. v.), which completely explained the apparent discrepancy. But the question between the rival theories was finally settled by Fizeau and Foucault, who, by processes entirely different, but agreeing in their results, determined the velocity of light in air and in water.

Now, Newton had shewn that refraction, such as that of light by water, if predicated of moving *particles*, requires that they should move faster in water than in air. Huyghens, again, had shewn, that if such refraction be predicated of *waves*, they must move slower in water than in air. Fizeau and Foucault found, by direct measurement, that light moves slower in water than in air. Hence it is certain that *light consists in the transference of energy, not of matter*; and the Undulatory Theory is based upon this fact.

But, as to the manner in which energy is thus transferred, we are entirely ignorant. The common assumption is, that waves of distortion are propagated in the ether. The nature of this motion will be described under WAVE. But many other modes have been suggested, one of the most notable of which is that of Rankine. Here the particles of ether are not supposed to be *displaced*, but each is merely made to turn about an axis as the wave of light passes it; the particles having Polarity (q. v.), by virtue of which they arrange themselves in similar positions when no light is passing, and by

which, also, any rotation of one particle produces a consequent rotation of those in its neighbourhood. For the explanation of most of the common phenomena of optics, it is quite indifferent which of these assumptions we make, and, indeed, theory has not yet been carried far enough to enable us to devise experimental methods of testing which is the more likely to be the case in nature. It cannot be too strongly insisted on that all we know at present is, that light certainly depends on the transference of energy from one part of the luminiferous medium to another; what kind of energy is transferred, vibratory or oscillatory motion, or rotation, &c., is a problem which may possibly for ever remain unsolved. But vibratory wave-motion being that with which we are most familiar, as in earthquakes, sound, waves in water, &c., we naturally choose this as the most easily intelligible basis of explanation and illustration. And we shall now briefly shew how the laws of linear propagation, reflection, single refraction, interference, diffraction, dispersion, polarisation, and double refraction may be accounted for.

We assume, then, that light consists in a succession of waves, and for our earlier inquiries it does not matter whether they be (like those of sound) waves of condensation and rarefaction, in which the vibrations take place *in* the direction of the ray, or (like those in water) waves of distortion or displacement without condensation, in which case the luminous vibrations must be assumed to take place in some direction *perpendicular* to the ray. The phenomena of polarisation and double refraction shew us that the former of these hypotheses is untenable.

Propagation of Light in a Uniform Isotropic Medium. (An isotropic medium is such that if a cubical portion be taken, it possesses precisely the same properties whatever be the directions of its sides. Glass and water are isotropic, rock salt and ice are not.)—Suppose AB (fig. 1) to represent at any time

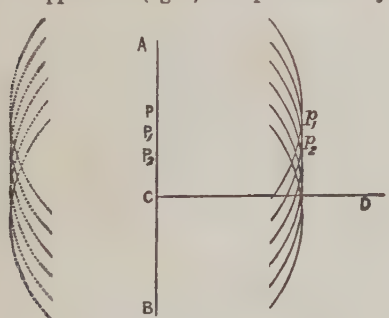


Fig. 1.

the *front* of a plane wave which is passing in the direction CD; i. e., suppose all particles of the ether in the plane AB (perpendicular to the plane of the paper) to be similarly and equally displaced. According to Huyghens, we must suppose every particle, P, to be itself the source of a wave, which, from the uniformity of the medium, will spread with the same velocity in all directions. With centre P, and radius the space which light passes over in any assigned interval t, describe a sphere represented in section by a circle in the figure. Do the same for adjacent points, P_1, P_2, &c. Let p_1 be the intersection of the circles whose centres are P and P_1, p_2 that of the circles whose centres are P_1 and P_2, and so on. Then, as p_1 is *equidistant* from P and P_1 and (approximately) from all points of a small circular space between P and P_1 on the wave-front AB, all the separate wave-disturbances coming from these points to p_1 will be in the same *phase* (see WAVE), and will therefore combine so as to strengthen each other; while in other directions they will be in different phases, and combine to destroy each other. The locus of all such points as p_1, p_2, &c., will therefore, at the end of the time t, contain all particles of the ether equally and similarly disturbed, and will thus be the new wave-front. But it is obviously a plane parallel to AB. Also the disturbance at P has passed to p_1; and, when the distance PP_1 is taken as very small, Pp_1 is perpendicular to the wave-front AB. Hence, in such a medium, a plane wave remains plane, and moves with uniform velocity in a direction perpendicular to its front. [There is a difficulty as to what becomes of the disturbance, which, according to Huyghens's assumption, ought to travel *back* into the dotted portions of the spheres; and it is not easy to account for the absence of this on mechanical principles. But we are content here to take for granted that no waves are propagated backwards from the main wave, as a fact clearly proved by experiment.] Since a small portion of the surface of any curved wave may be considered as plane, we now see how any such wave will be propagated in an isotropic medium. Erecting perpendiculars at every point of the surface of the curved wave, and laying off along these lines the space which light passes over in a given interval, the extremities form a new surface, which is the wave-front after the lapse of that interval.

Reflection at a Plane Surface.—Suppose AB (fig. 2) to be a plane wave-front, moving in the direction Bb

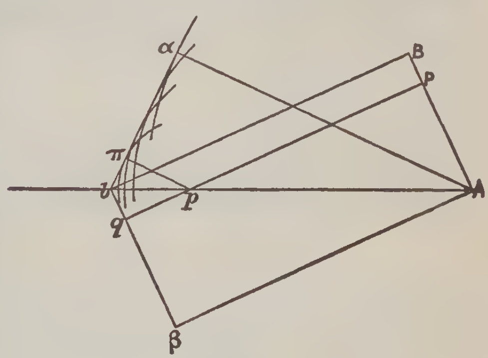


Fig. 2.

perpendicular to AB. Let Ab be the reflecting surface, and let the intersection of the plane of the wave-front with the reflecting surface be a line through A perpendicular to the paper. When B has arrived at b, A would have arrived at β, and P at q (where $b\beta$ is parallel to BA, and Pq and Aβ to Bb), had it not been for the reflecting surface. Hence, when B is at b, A has diverged into a sphere of radius Aβ P from p into a sphere of radius pq; and so for each point of the wave-front. Now, the spheres so described about A and p as centres obviously touch the plane $b\beta$; consequently, they touch the other plane $b\alpha$, which makes the angle A$b\alpha$ equal to A$b\beta$. Now, $b\pi\alpha$ is the front of the reflected wave, and Aα is the direction in which it is proceeding. Hence, obviously, the ordinary laws of Reflection. See CATOPTRICS.

Refraction at a Plane Surface into an Isotropic Medium.—Here we take account of the change of velocity which light suffers in passing from one medium to another. In fig. 3, A, P, B, b, p, q, and β represent the same as before—but suppose

$A\alpha$ now to represent the space through which the wave travels in the second medium, while it would travel from B to b in the first. With centre A, and

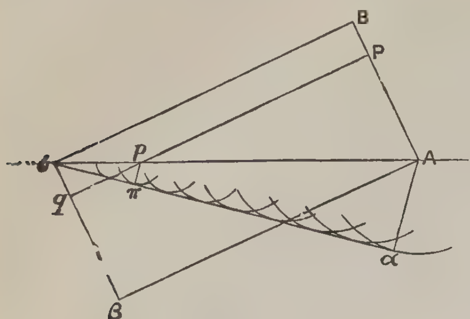


Fig. 3.

radius $A\alpha$, describe a sphere. Let $b\alpha$ touch this sphere in α. Then $b\alpha$ is the front of the refracted wave. For, if $p\pi$ be drawn perpendicular to $b\alpha$, we have

$$p\pi : A\alpha :: bp : bA :: pq : A\beta.$$

Hence, while A travels to α, and B to b, P travels to p, and thence to π. And the sines of the angles BAb and $Ab\alpha$, which are the angles of incidence and refraction, are to each other as Bb to $A\alpha$, i. e., as the velocity in the first medium is to that in the second. See DIOPTRICS.

It is obvious from the cut, that, the *less* is the velocity in the second medium, the more nearly does the refracted ray enter it at right angles to its surface. As a contrast, we may introduce here a sketch of Newton's admirable investigation of the same problem on the corpuscular hypothesis. Let AB (fig. 4) be the common surface of the two media,

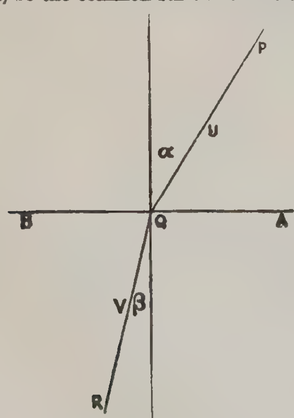


Fig. 4.

PQR the path of a corpuscle. Let U and V be the velocities in the two media, α and β the angles of incidence and refraction. Then the forces, which act on the corpuscle, being entirely perpendicular to the refracting surface, the velocity *parallel* to hat surface is not altered. This gives

$$U \sin. \alpha = V \sin. \beta.$$

Also the kinetic energy is increased by the loss of potential energy in passing from the one medium to the other. Hence the square of V exceeds that of U by a quantity which depends only on the nature of the two media and of the corpuscle. This shews that V is the same whatever be the direction of the ray, and then the first relation proves that the sines of the angles of incidence and reflection are *inversely* as the velocities in the two media; i. e., the refracted ray is more nearly perpendicular to the refracting surface the *greater* is the velocity in the second medium. It is very singular that two theories, so widely dissimilar, should each give the true *law* of refraction; and, in connection with what has just been said, it may be mentioned, that on the corpuscular theory a corpuscle passes from one point to another with the least *action*, while on the Undulatory Theory it passes in the least *time*. Hamilton's (q. v.) grand principle of *Varying Action* includes both of these.

Interference.—Fresnel's mode of exhibiting this phenomenon (whose discovery, as before said, is due to Young) is very simple and striking. An isosceles prism of glass, with an angle very nearly 180°, is placed, as in fig. 5, symmetrically in front of a brilliant point (the image of the sun formed by a lens of very short focus, for instance). The effect of the prism is that light which passes from O through the portion QR appears to have come from some

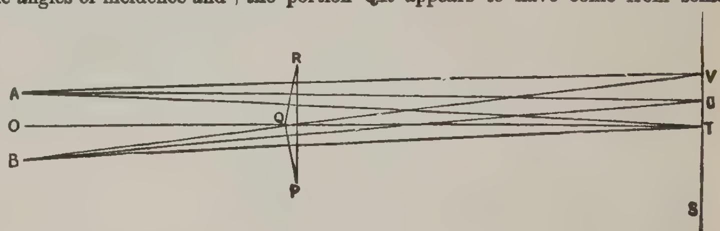


Fig. 5.

point such as A (the image of O as seen through the upper half of the prism). Similarly, the light which has passed through PQ appears to come from some point B. The light which has passed through the prism is to be received on a white screen ST. At the point T, which is in the prolongation of the line OQ, the distances TA and TB are equal; but for no other point, as U, in the line ST, are UA and UB equal. Suppose U and V to be such that UA and UB differ in length by half a wave-length of some particular colour, VA and VB by a whole wave-length of the same; then waves arriving at T, as if from A and B, have passed over equal spaces, and consequently their crests coincide, so that at T they reinforce each other. But at U, a hollow from A is met by a crest from B, so that darkness is the result. At V, again, crest and crest coincide. And so on. Hence, if we are experimenting with one definite colour of light, the effect on the screen is to produce at T, V, &c., bright bands of that colour, all parallel to the edges of the prism PQR. At points like U, there are dark bands. And the length of a wave can easily be calculated from this experiment; for the lengths of OQ and QT can be measured, and knowing the angles of the prism and its refractive index (see REFRACTION) for the particular colour employed, we can calculate the positions of A and B. We have then only to measure the distance TV between the centres of the two adjoining bright bars, and then geometry enables us to calculate the difference of the lengths of VA and VB, which, as we have seen, is the length of a wave. The results of this experiment shew how very minute

are these wave-lengths for visible rays. Thus, for

	Inch.
Extreme Red, the wave-length in air is	0·0000266
" Violet, " " "	0·0000167

These are, roughly, the $\frac{1}{40,000}$th and the $\frac{1}{60,000}$th of an inch. Seeing, then, that light describes 200,000 miles per second, the number of waves which enter the eye per second are—

Extreme Red, . .	460 millions of millions.
" Violet, . .	730 " "

These numbers, compared with those of sonorous waves (see SOUND) shew the extraordinary difference in delicacy between the optic and auditory nerves. But whereas the range of the ear is somewhere about 12 octaves, that of the eye is less than one.

Diffraction.—This has been already illustrated in a previous volume.

Dispersion.—We have just seen that, by Fresnel's interference experiment, waves of different lengths are separated (for in the last figure the position of the bright line, V, depends on the length of the waves which produce it). But the different colours are also separated by common refraction, as in Newton's celebrated experiment. See SPECTRUM. This shews, of course, that in refracting media, waves of different colours move with different velocities; and, as the violet are more refracted than the red, it appears that the shorter waves move more slowly in glass or water than the longer ones. In free space, waves of all lengths travel with equal speed, else (see ABERRATION) all stars ought to appear drawn out into spectra, in consequence of the earth's annual motion. Also, a star suddenly breaking out, or suddenly vanishing (a phenomenon several times observed), should flash out first red, and gradually become white, or should gradually decay from white to violet, which is not observed to be the case. These facts are the most difficult to explain of any to which the Undulatory Theory has yet been applied. Fresnel, indeed, appears to have been in possession of a solution of the difficulty, but the Appendix to one of his papers, to which he more than once refers as containing this explanation, was not found among his MSS. Cauchy and others have, however, by delicate investigations, shewn that, *if the forces exerted by the molecules of a refracting body on the ether are exerted through distances comparable with the length of a wave*, the velocity of light will then depend on the wave-length. The velocity is, in fact, shewn to be represented by a formula such as this:

$$A - \frac{B}{\lambda^2},$$

where A and B are constant quantities for a given medium, and λ is the length of a wave. The larger λ is, the less is the second term of the formula, and therefore the velocity is the greater. A very singular result follows from this formula—viz., that the velocity becomes more and more nearly equal to A as the wave-length is greater. Hence, waves of low radiant heat, which (see HEAT) are merely waves of light which are incapable of producing vision, must be crowded together towards a limit, not very far beyond the red end of the spectrum.

Polarisation.—We now come to a set of phenomena which give us some further information as to the nature of luminiferous waves. When two beams of light, such as those in Fresnel's experiment, are polarised in planes perpendicular to each other (see POLARISATION) before they meet, *they do not interfere.* This is in accordance with the assumption required for the explanation of the existence of polarisation itself—viz., that the vibrations of the either take place *transversely* to the direction of the ray.

Double Refraction.—Our assumptions, forced upon us by experimental results, are now so far complete that we may proceed, after Fresnel, to apply them to the explanation of double refraction. See POLARISATION; REFRACTION, DOUBLE. This explanation is extremely beautiful, and when published, was justly hailed as the greatest step in physical science which had been made since Newton deduced the facts of physical astronomy from the law of gravitation.

As we have seen above, in treating of simple reflection and refraction, that the form and velocity in and with which a disturbance spreads from any point of a wave, is all that is required for the determination of the course of a ray, we must endeavour to find the form in which a disturbance spreads in a double-refracting crystal, and this should lead us to a construction for each of the two rays.

Huyghens had already pointed out that one of the two rays produced by Iceland spar follows the ordinary law of refraction. Hence, the disturbances which give rise to this ray are propagated in spherical waves in the crystal. He shewed also that the other ray could be accounted for, if the disturbances to which it is due were propagated in the form of an oblate spheroid touching the sphere with the extremities of its axis, that axis being parallel to the crystallographic axis of the mineral. The following diagram (fig. 6) will make this clear: P is the

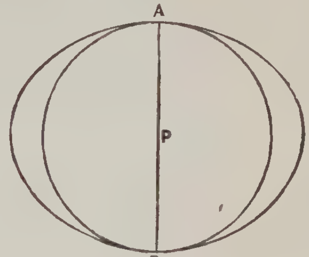


Fig. 6.

point where the ether is disturbed. Two waves spread from P in the form shewn in the cut, the line APB being the axis of rotation of the spheroid, and parallel to the axis of the crystal. Thus, let rays αA, &c. (fig. 7), of which AB is the wave-front, fall upon the surface Ab of such a crystal; and let AC be the direction of its axis. Draw, about A as

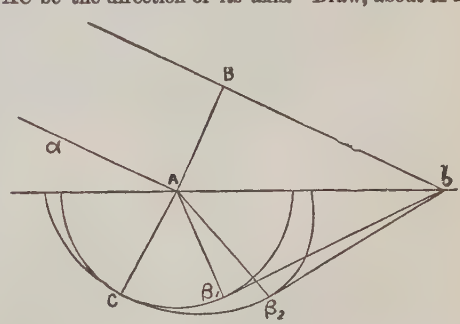


Fig. 7.

centre, the sphere and spheroid into which the disturbance at A spreads in the crystal while light in air passes from B to b. Then if planes be drawn through

the line b (perpendicular to the paper) so as to touch the sphere in β_1, and the spheroid in β_2, these planes will touch respectively all the intermediate spheres and spheroids produced by disturbances at points between A and b. [This is evident from simple geometry.] Thus, $b\beta_1$ and $b\beta_2$ are the new wave-fronts; and the ray aA, falling on the crystal, is divided into the two Aβ_1 and Aβ_2. Of these, Aβ_1 is the ordinary ray, and, being produced by spherical waves, has all the properties of a ray ordinarily refracted. It obviously moves perpendicularly to its front, as Aβ_1 is perpendicular to $\beta_1 b$.

But it is otherwise with Aβ_2, which is, in general, *not perpendicular to its front*, $\beta_2 b$. Again, if AC, the axis of the crystal, be not in the plane of incidence, the ray Aβ_2 is not in that plane; so that here we have *refraction out of the plane of incidence.*

The exact accordance of this construction with observation was proved by the careful experiments of Wollaston. We have only to add, that the two rays Aβ_1 and Aβ_2 are, in all cases, completely polarised in planes at right angles to each other.

The experiments of Brewster shewed that in by far the greater number of minerals and artificial crystals, *both* rays are extraordinary—i. e., neither of them can be accounted for by disturbances propagated spherically in the crystal. But no tentative process could lead to the form of the wave-surface in this most general case. Here Fresnel's genius supplied the necessary construction.

He assumes that the ether in a crystallised body is possessed of different rigidity, or different inertia, in different directions; a supposition in itself extremely probable, from the mechanical and other properties of crystals. In the general case, there are shewn to be three principal directions in a crystal, in any one of which, if the ether be displaced, the resulting elastic force is in the direction of the displacement. Each of these is, in all cases, perpendicular to the others. Any given displacement of the ether corresponds to partial calculable displacements parallel to each of these lines, and thus the elastic force consequent on any displacement whatever is known if we know those for the three rectangular directions. All the calculations are thus dependent on *three* numbers only, for each substance.

To find the form in which a disturbance will spread, Fresnel proceeds as follows. Let the plane of the paper represent the front of a wave in the crystal, and suppose a particle of ether to be displaced in it from A to B (fig. 8). This displacement may be resolved (by the law of the parallelogram of velocities, forces, &c.) into two components in any two directions in the plane of the paper. Assume

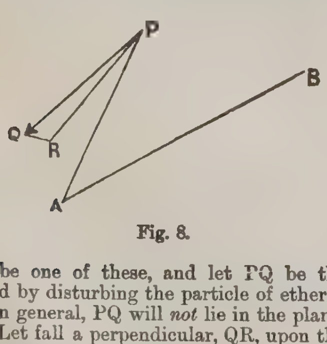


Fig. 8.

AP to be one of these, and let PQ be the force produced by disturbing the particle of ether from A to P. In general, PQ will *not* lie in the plane of the paper. Let fall a perpendicular, QR, upon the plane of the paper. In general, the point R will not lie in AP. The portion RQ, of the elastic force of the ether, Fresnel neglects, because it would produce vibrations perpendicular to the wave-front, i. e., *similar to those of sound*, and he assumes that such normal vibrations do not produce visible light. We shall recur to this point. Fresnel now assumes that the vibrations which will be propagated continuously in the crystal are such as have PR coincident in direction with AP; and then the rate of their propagation will depend upon the ratio of PR to PA. He shews by mathematical reasoning that there are *two* such directions in every wave-front, and that they are always *perpendicular* to each other. This, of course, at once accounts for double refraction, the complete polarisation of each of the two rays, and their being polarised in planes perpendicular to each other. The original plane wave is now broken into two, both parallel to the first, but in general moving at different rates. He next considers a disturbance at any point in a crystal as equivalent to waves having fronts in *every* plane passing through that point, and investigates mathematically the form of the surface which is touched by the planes of all the pairs of polarised rays which have (in any given time) proceeded from each of those wave-fronts. The form of this surface is very remarkable. It is symmetrical with reference to three planes at right angles to each other. These, of course together, cut it into eight parts, one of which is figured below (fig. 9). From this it appears, though Fresnel did not perceive it, that the surface has four *conical cusps*, as they are called, the inner

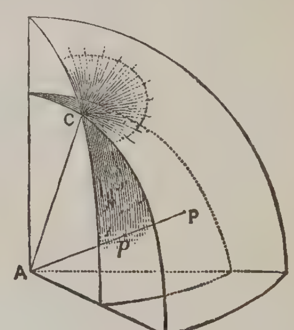


Fig. 9.

portion seeming to be drawn through a hole, as it were, and then spreading out again to form the outer portion. The external appearance of these points very much resembles the portion of an apple round the point of attachment of the stalk. Fresnel shewed that, in particular cases, when two of the three principal elasticities are equal, this surface degenerates into the sphere and spheroid of Huyghens, already described for Iceland spar; and that, when all three are equal, it becomes a single sphere, as in glass, water, and other singly refracting bodies. All this, of course, is in complete accord with experiment. But there is vastly more. If we use the wave-surface of Fresnel to construct the refracted rays, just as we employed the sphere for simple refraction, or the sphere and spheroid for Iceland spar, we find generally *two* definite refracted rays (both usually out of the plane of incidence) for one incident ray. But Hamilton (q. v.), who was the first to perceive the existence of the cusps already described, saw that they indicated the existence of a very remarkable phenomenon, to which he gave the name of Conical Refraction (q. v.). The ray which, in the crystal, passes from A to C (the cusp, see last figure), has not, like other rays such as ApP, two definite wave-fronts. For if at p and P, where the line ApP meets the inner and outer portions of the wave-surface, we draw tangent planes, these are the definite fronts of the corresponding

waves; so that such a ray will split into two only, on leaving the crystal. But AC intersects the surface at C, where it is *conical*, and has an *infinite* number of tangent planes, so that when it leaves the crystal it will split into an infinite number, forming a hollow cone. Hamilton's prediction then was: If a single ray of light be made to pass through a plate of a biaxal crystal in the direction AC (limiting it, for instance, by sheets of tinfoil with small holes in them properly fixed on each side), it will enter and emerge as a hollow cone. Also the plane of polarisation will differ for different rays in this cone. Lloyd completely verified this wonderful prediction by experiments made with a plate of *Arragonite* (q. v.). But more, Hamilton observed that (see last figure) the wave-surface can be touched by a tangent plane in a circle surrounding the cusp. If, then, we make the construction of fig. 7 with Fresnel's wave instead of the sphere and spheroid, there will be a definite direction of the incident ray αA, for which the tangent planes $b\beta_1$ and $b\beta_2$ in that figure will coincide, and will touch the wave-surface in the circle about the cusp. Any line drawn from A to a point in that circle will be a direction for a refracted ray. Hence the ray αA will be broken up into a hollow cone of rays, the vertex of the cone being A, and its base this circle. If the crystal be cut into a plate, each ray will of course emerge parallel to αA, and the *ensemble* of them will form a hollow cylinder. The prediction, then, is that a single definite ray, falling in a given direction on such a plate of crystal, will emerge as a hollow cylinder. This, and the predicted laws of the polarisation of the light of the cylinder, were also verified by Lloyd.

'The formulæ which led to such triumphantly successful predictions *may* have been deduced from incomplete or even erroneous premises; but they *represent a truth*, and must in time conduct us step by step back to ultimate proof of the truth of Fresnel's assumptions, and of the Undulatory Theory of Light as now understood, or shew us what modifications may be required in the original conceptions.'

It would unduly lengthen this article, and besides would lead us into discussions far too recondite for a work like this, to enter upon the question of whether the vibrations in polarised light are *perpendicular to* or *in* the plane of polarisation, a subject which has recently been well investigated by Stokes (q. v.); or to consider the production of elliptically polarised light by reflection at the surface of metals, diamond, &c.; and various other most important points of the theory. We can only mention that Green, Cauchy, Stokes, and others, who have entered deeply into the mechanical question of luminiferous vibrations, have found themselves obliged to take into account the *Normal* wave, which, as we have seen, Fresnel neglected.

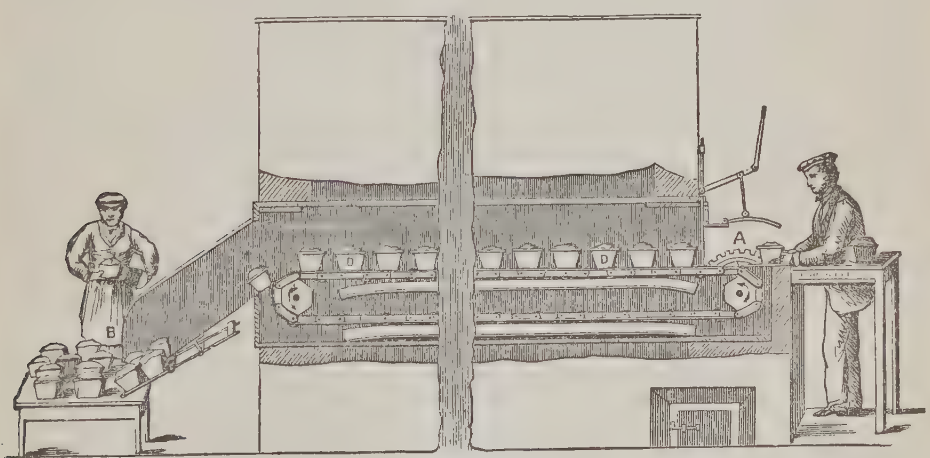
Fluorescence (see PHOSPHORESCENCE), Spectrum Analysis (see SPECTRUM), and various other important recent additions to the theory, must be merely mentioned; as also the very remarkable observation of Maxwell, which appears to connect Light and Electricity, and was derived from a theory which assumes the ether to be the vehicle of Electricity and Magnetism as well as of Light and Heat, and by which it appears that the velocity of Light is expressible in terms of the static and kinetic units of Electricity.

For further information, we refer the reader to Lloyd's *Wave-theory*, an excellent elementary treatise; while to the more advanced mathematician we may commend Airy's *Tract on the Undulatory Theory*, and Herschel's article 'Light' in the *Encyclopædia Metropolitana*.

Undy.

UNDY, in Heraldry, the same as Wavy. See HERALDRY.

UNFERMENTED BREAD. Under this heading we may briefly notice one or two improvements which have been introduced into the manufacture of AËRATED BREAD since the article on that subject was published in the first volume of this *Encyclopædia* in 1860, and the general bearings of this kind of baking, and of the bread thus produced, upon public health and upon the subject of medical dietetics. In 1862, the 'Aërated Bread Company (Limited)' was established for purchasing from the patentee, Dr Dauglish, the sole right of manufacturing this kind of bread in and around London; and from that time, the use of this new article of food has become much more extensive. Indeed, at the present day, Dauglish's Aërated Bread is manufactured not only in most of the



Dr Dauglish's Travelling Oven:

A, the mouth, and B, the tail of the oven; C, C, oven flues; D, D, the loaves in their tins moving onwards from the mouth of the oven to its tail; E, the door of one of the furnaces. (To save space, only the two ends of the oven are represented.)

large towns of England and of the United States, but also in Melbourne, Adelaide, and Sydney. In the working of the original patent, it was found that the pressure at the commencement of the process of driving the mixed ingredients from the iron box * through a cock or tap at the bottom was so violent as to give almost an explosive expansion to the ejected portion of dough, causing the structure of the bread more to resemble whipped cream or froth than fermented bread. This was a point of greater importance than might have been anticipated, because it is found by experience that the flavour and other palatable qualities depend in a great measure on the internal arrangement of the loaf. Moreover, a great part of the pressure obtained was entirely wasted. In the *Times*' city article of December 30, 1864, a new patent is described as having been taken out by Dr Dauglish, whose purposes are first, and chiefly, to improve the 'piled elastic texture' of aërated bread; and secondly, to provide mechanical means for dividing the dough into the requisite exact and uniform measured quantities for loaves, and for delivering each loaf into the tin in which it is to be baked. Dr Dauglish's last patent—his new mechanical or travelling oven—was only completed shortly before his death, which took place in the spring of 1866. In this oven, the loaves, after being placed on the movable bottom at the mouth, are carried with a regular intermittent motion, in an endless chain, which forms the movable bottom, through a chamber varying in length from 20 to 50 feet, to the end or tail of the oven. This chamber is heated by two or more furnaces, the flues of which are kept separate, each furnace heating its own portion. Small windows are inserted at intervals, by means of which the baking can be watched during its progress. The mouth of the oven is protected by two doors, which are lifted and shut alternately by an arrangement of apparatus worked by the same power which causes the endless chain constituting the movable bottom to traverse the length of the oven: the work of charging the oven goes on incessantly while the loaves are on their journey towards the tail of the oven; and the opening and shutting of the two oven doors is so arranged as to prevent the escape of the heat or steam from the interior of the oven. On the arrival of the loaves at the tail of the oven, the baking process is completed, and they are tipped off the revolving bottom, falling, by their own weight, on to a table placed ready to receive them. The mechanism at the tail of the oven is likewise so arranged as to prevent the escape of the heat or steam in the oven. By means of this travelling oven, the old and laborious plan of putting into and taking out of the oven each loaf separately with the peel (so injurious to the health of the journeyman baker) is henceforth abolished in the making of aërated bread.

Hitherto, the carbonic acid gas employed in the manufacture of aërated bread has been solely obtained from carbonate of lime and sulphuric acid. The Aërated Bread Company are now carrying on experiments regarding the possibility of applying the carbonic acid of the great London breweries (now a wasted product) to the aëration of their bread, and the results hitherto obtained have been most satisfactory; while there is not the slightest doubt of the essential purity of the gas, in so far as deleterious matters are concerned, the delicate flavour of both hops and malt conveyed in the form of aromatic vapour by the gas to the dough communicates to the bread a singularly agreeable and palatable flavour.

No one who takes an interest in the sanitary conditions of various trades, and who has read Mr Tremenheere's 'Report on the Sanitary Condition of Journeymen Bakers,' drawn up in 1862, and published by order of government; or a very powerful article upon that commissioner's Report in the *Times* of August 1862; or a late pamphlet by Dr Guy on the same subject, can doubt that the general introduction of aërated bread would cause the saving of a large number of human lives, now annually sacrificed in the London bakeries alone. Dr Guy states that no class of men, save the Redditch needle-grinders, are liable to so severe and often fatal diseases of the chest. Forty-two years is rather over the average duration of life among them, and they are often completely enfeebled in very early life by frequent attacks of rheumatism. Under the new system, the business of a journeyman baker, from being almost certainly fatal, would become a healthy rather than a dangerous one. The evidence given in Mr Tremenheere's Report treats not only of the bakers, but also of 'the Bread we eat.' The statements made on the latter subject are so appallingly disgusting and filthy, that, in mercy to our readers, we decline to repeat them; and those who honestly desire to know how (at all events, in a vast number of bakeries) their bread is really made, may readily consult his Report.

The dietetic advantages of aërated bread are apparently so obvious, that it is surprising that they are not even more generally recognised than seems at present to be the case. Its perfect cleanness and purity, its light and uniform texture, and its sweet and agreeable flavour, are strong claims upon acceptance. To the working-man, it is especially suited, because it retains much of the ingredients of the wheat which enter into the formation of blood and muscle, and are allowed to escape in fermented bread. It is strongly recommended by medical men not only as an article of ordinary diet, but particularly in cases of indigestion; and according to Dr Corfe of the Middlesex Hospital, most especially 'in those cases of dyspepsia which so often affect the brain-workers of the great metropolis, men who work for the press, &c.' Mr Sanger, medical officer at the Convalescent Hospital, Seaford, has recently pointed out, amongst many medical uses of this bread, its use as a food for infants when they are brought up wholly or partially by hand. 'I have seen,' he observes, 'children pining away from diarrhœa and atrophy under a diet of common pap, or *Tout les Mois*, or any of the compounds which are vaunted as wonderful food for infants, recover in a very short time after the aërated bread has been substituted for them. This bread forms a soft jelly-like compound when mixed with milk and water, which is easily sucked through the tube of a common feeding-bottle, and with a little fine sugar, makes a food of which infants grow very fond.'—*Lancet*, December 10, 1864. Cases of indigestion, flatulence, &c., not unfrequently occur in which no kind of bread (even well-made country bread) can be borne with comfort. In such instances, if there is no ready access to aërated bread, it may be obtained weekly from the large cities, as it possesses the merit of being almost as palatable on the tenth day as on the day of its baking. See *Mechanic's Magazine*, March 24, 1865. For an account of French and Austrian bakeries and their bread, see W. E. Johnston, M.D., *Report on the Preparation of Bread*, *Rep. of Com. to Paris Exhib.*, Washington, 1868.

UNGHVA'R, an important market-town in the north-east of Hungary, is charmingly situated

* The statement in the article AËRATED BREAD, that 'in ten minutes or so it' [the dough] 'is taken out, shaped into loaves, &c.,' is hardly correct. It was *driven* or *projected out* by internal pressure through a temporary aperture made by a cock or tap

on the river Ungh, 90 miles north-north-east of Debreczin. It is the residence of a bishop, and contains a very old castle, a beautiful church, a seminary, and gymnasium. Wine is grown. Pop. 8537.

U'NGUENTS, or OINTMENTS, are employed in medicine as external applications. They consist of some active agent in solution or in the form of a soft extract, or in fine powder, carefully rubbed up with some kind of fatty matter, or a mixture of several such matters, as prepared lard, prepared suet, white wax, yellow wax, olive oil, and almond oil. There are no less than 28 ointments in the British *Pharmacopœia*. Some, as the ointments of aconitia, atropia, and belladonna, are employed to allay neuralgia and local pains; simple ointments (consisting of white wax, prepared lard, and almond oil) are employed in dressing raw and blistered surfaces; the ointments of cantharides and of savin are used to keep up the discharge from issues or blistered surfaces; the ointments of creosote, galls, carbonate of lead, oxide of zinc, &c., serve as astringents; those of ammoniated mercury, calomel, nitrate and red iodide of mercury, iodine, iodide of potassium, elemi, resin, and turpentine, act as astringents of varying power, and that of red oxide of mercury as a mild caustic. Many of the ointments are of special service in skin diseases, and sulphur ointment is the specific application for itch.

UNGUICULA'TA (Lat. clawed), in Zoology, a section of the class Mammalia, consisting of those animals which have toes furnished with nails or claws. In the system of Linnæus, it includes the orders *Bruta*, *Glires*, *Primates*, and *Feræ;* in that of Cuvier, the orders *Bimana*, *Quadrumana*, *Carnaria*, *Marsupialia*, *Rodentia*, and *Edentata*.

UNGULA'TA (Lat. hoofed), in Zoology, a section of the class Mammalia, consisting of those animals which have hoofs. In the system of Linnæus, it includes the orders *Belluæ* and *Pecora;* in that of Cuvier, the orders *Pachydermata* and *Ruminantia*.

UNGULED, in Heraldry, a term applied to the tincture of the hoofs of an animal; e. g., Azure, a stag trippant or, attired and unguled gules, the arms of the family of Strachan in Scotland.

U'NICORN (Lat. *unum cornu*, one horn), an animal probably fabulous, mentioned by ancient Grecian and Roman authors as a native of India, and described as being of the size of a horse, or larger, the body resembling that of a horse, and with one horn of a cubit and a half or two cubits long on the forehead, the horn straight, its base white, the middle black, the tip red. The body of the animal was also said to be white, its head red, its eyes blue. It was said to be so swift that no horse could overtake it. The oldest author who describes it is Ctesias, who resided for many years as physician at the court of Artaxerxes Mnemon, and who wrote about 400 B. C. His information, however, was all at second-hand. He calls it the Wild Ass (*Onos agrios*). Aristotle briefly mentions it under the name of Indian Ass, saying: 'We have never seen a solid-hoofed animal with two horns, and there are only a few of them that have one horn, as the Indian Ass and the Oryx.' Pliny nearly follows Aristotle, but says that the Indian Ass is one-hoofed, and the Oryx two-hoofed. He speaks also of the *Monokeros*, a very fierce animal, with the body of a horse, the head of a stag, the feet of an elephant, the tail of a wild boar, and a single horn. All these accounts are evidently untrustworthy, and much tinged with fable. Not more credible are those of more modern authors. Lobo, in his History of Abyssinia, describes the U. as resembling a beautiful horse; but there is no good evidence of the existence of any such animal there or in any part of the world. Its existence, however, is not to be decided against on any other grounds; for there does not appear to be anything monstrous or absurd in the notion. Although the descriptions of the U. given by the ancients are very unlike the Indian rhinoceros, yet probably that animal was the origin of them all. In like manner it seems probable that the head of a U., which Barrow saw depicted on the side of a cavern in South Africa, and the head of a U. described and figured by Campbell in his *Second Journey in South Africa*, are to be referred to some species of rhinoceros. The word U. is unhappily used in versions of the Old Testament for the Hebrew *rĕēm*. The Septuagint led the way in this, by using the Greek *monokeros;* and it has been supposed by many that the animal meant is a rhinoceros. The rĕēm was, however, certainly not a one-horned, but a two-horned animal. In Deut. xxxiii. 17, where the English version has 'horns of unicorns,' the correct translation is 'horns of a rĕēm.' Other circumstances, as an allusion to the gambolling of the young, are also unfavourable to the idea that a rhinoceros is intended.

The U. is perhaps best known as a heraldic charge or supporter. Two unicorns were borne as supporters of the Scottish royal arms for about a century before the union of the crowns; and the sinister supporter of the insignia of the United Kingdom is a unicorn argent, armed crined, and unguled or, gorged with a coronet composed of crosses patée and fleurs-de-lis, with a chain affixed, passing between the fore-legs, and reflexed over the back, of the last.

Unicorn.

U'NIFORM (one form), in its Military and Naval sense, means the particular dress and equipment assigned by proper authority to each grade of officers and men. The clothing consists of one prevailing colour, variously ornamented and 'faced' according to the rank and corps. Although some regiments wear other colours, scarlet may be said to be the prevailing uniform of the British army; blue of the French; and white of the Austrian; dark blue is likewise the colour of the British navy. It is surprising how late the introduction of compulsory uniforms took place. We find soldiers serving with corps and yet dressed after the dictates of their own fancy well into the 17th c.; while in the navy, uniforms were not fixed with certainty until the beginning of the reign of King George III.

UNIFO'RMITY, ACT OF. See NONCONFORMISTS.

UNIGE'NITUS, BULL, one of the most important documents in the history of Jansenism. It was occasioned by the publication of the *Réflexions Morales* of Quesnel (q. v.), in which all the essential principles of Jansenism were revived, and although cautiously, yet systematically explained, so as to form the basis of that practical, moral, and religious teaching which it is the object of the *Réflexions Morales* to convey. The book was at first simply prohibited by a brief of Pope Innocent XI., in the year 1708; but, as it found many patrons, and especially the Archbishop of Paris, Cardinal de Noailles, it was deemed necessary to subject it to a more detailed examination, the result of which was that 101 propositions were extracted from it, and formally condemned, in 1713, by a bull commencing with the word 'Unigenitus.' The mode of condemning these propositions was peculiar, being that which is technically called *Damnatio in globo*. The whole body of propositions were condemned

as 'heretical,' 'false,' 'rash,' 'scandalous,' 'offensive to pious ears,' &c.; without, at the same time, any particular propositions being pointed out as deserving any one of these specific forms of censure. This circumstance, with others, gave rise to much controversy, and to a prolonged opposition to the bull. De Noailles and other bishops refused to accept it unless with certain qualifications; on the contrary, Louis XIV. insisted on unconditional acceptance; but on the death of Louis, the Regent, the Duke of Orleans, having given his countenance to the opponents of the bull, the resistance was persisted in; and eventually a declaration was put forth in 1717, by certain bishops, four in number, appealing from the pope to a general council. This appeal was condemned by the pope, nor was it countenanced even by the Regent; but a more modified appeal 'from the pope ill-informed to the pope better-informed,' was afterwards published by De Noailles, which obtained many adherents, and by which the opposition was kept alive to the end of the pontificate of Clement XI. in 1721, and even under his successors, Innocent XIII. and Benedict XIII. It was not till the year 1730 that, after the formal registration of the Bull Unigenitus by the parliament of Paris, the party thus created in France, and known under the name of 'Appellants,' received its final condemnation from the civil authority, after which it gradually died out, although some relics of it are still traceable, even after all the storms of the Revolution, in the so-called 'Petite Eglise.' See GALLICAN CHURCH.

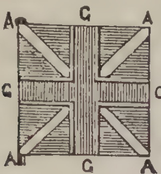
UNION. The crowns of England and Scotland were united under one sovereign on the accession of James VI. of Scotland to the English throne as James I. in 1603; but for above a century longer, each country continued to be ruled by its respective parliament, the interest of the one often coming into collision with that of the other. After various fruitless proposals for a closer connection of the countries, the Scotch were, in 1702, prevailed on to send 20 commissioners to London, who, with 23 English commissioners, should deliberate on the terms of a union. Their proceedings, after being broken off, were resumed in 1706. The Scottish commissioners were at first disposed for a mere federal union, and objected to the proposed assimilation of customs, excise, and regulations of trade; but a majority were at last brought over to the views of the English commissioners; and the minority, with one exception, yielded. The union, though popular in England, was the subject of great dissatisfaction in Scotland, being regarded by the bulk of the community as a surrender of national independence to a powerful rival. Addresses against it were presented from all quarters, and in some places the people rose in arms, forming regiments of horse and foot to oppose it. The treaty was, however, after strenuous opposition, ratified by the Scottish as well as the English parliament, and ultimately completed on May 1, 1707. Its principal conditions were the incorporation of England and Scotland into the United Kingdom of Great Britain, the succession of whose monarchs was to be the same as that of England. There was to be one parliament, in which the peers of Scotland would be represented by 16 of their number elected each parliament, and 45 Scotch members were to sit in the House of Commons. All rights and privileges were to be communicated between the subjects of both kingdoms, unless when otherwise agreed. The Episcopal Church was confirmed in England, and the Presbyterian in Scotland. Scotland was to retain her Courts of Session and Justiciary, and to have a separate seal for private rights and grants. While the parliament was to raise £2,000,000 by land-tax, Scotland would contribute £48,000 of that sum. The laws of trade, customs, and excise in Scotland were to be assimilated to those of England, and the coinage, weights, and measures of the two countries were to follow a uniform standard. In other matters, the laws of Scotland were to remain in force, but might be altered by the parliament of Great Britain. The separate Privy Council of Scotland, which the Act of Union left untouched, was abolished the following year.

Ireland remained a distinct kingdom till 1801, when it was united with Great Britain into the United Kingdom of Great Britain and Ireland. By the terms of the union, the separate parliament of Ireland was done away with, and Ireland was represented in the parliament of the United Kingdom by 4 lords spiritual and 28 lords temporal in the House of Lords, and 120 members of the House of Commons. Power was reserved to the sovereign to create one peer of Ireland for every three extinct peerages, and when the peerage of Ireland became reduced to 100, to create one peerage for each one that became extinct, so as to keep the peerage of Ireland up to 100, over and above those Irish peers who are also peers of England or Great Britain. The churches of England and Ireland were united into one Protestant Episcopal Church. The subjects of Ireland were placed on the same footing as those of Great Britain in respect of trade and navigation, and in all treaties with foreign powers; and the law-courts of Ireland were to continue, subject to the regulations of parliament; writs of error and appeals being decided by the House of Lords.

UNION COLLEGE, Schenectady, New York, was incorporated in 1795, chiefly by the efforts of General Philip Schuyler. It was named Union from its being established by the co-operation of several religious denominations. Its first president was John Blair Smith of Philadelphia, who was succeeded in 1799 by Jonathan Edwards, the younger; but its great prosperity and usefulness were secured under the presidency of Rev. Eliphalet Nott, from 1804 until his death in 1866. By his zeal, enterprise, and large benefactions, it was endowed and furnished with spacious buildings, a large library, and extensive cabinets of natural history. Dr Nott was succeeded by Dr Laurens P. Hickok, the distinguished metaphysician. In 1869, Dr Aiken of Princeton was called to the presidency. Resigned in 1871; when Dr Eliphalet N. Potter, son of Bishop Alonzo Potter, and grandson of Dr Nott, was made president. Under his administration the institution has increased in funds and students. In its general aims it has been greatly enlarged by a connection with the Law and Medical Colleges at Albany, and now, together with them, bears the name of Union University, of which the president of Union College is the chancellor. It has 14 professors, 160 students, and a library of about 12,000 volumes.

UNION-JACK (from the *jacque*, or surcoat, charged with a red cross, anciently worn by English soldiers—see JACK), the national banner of the United Kingdom of Great Britain and Ireland, formed out of a combination of the crosses of St George (argent, a cross gules), of St Andrew (azure, a saltire argent), and of St Patrick (argent, a saltire gules), these three crosses being the national banners of England, Scotland, and Ireland respectively. The first union-jack, which was introduced by a royal proclamation in 1606, three years after the union of the Scottish with the English crown, combined only the crosses of St George and St Andrew, and may be blazoned, azure, a saltire argent surmounted by a cross gules edged of the second. This combination was by royal proclamation of date 28th July

1707, constituted the national flag of Great Britain (fig. 1). On the union with Ireland, a new union ensign was devised, in which the cross of St Patrick was introduced, with its four limbs edged with white on one side. This awkward specimen of heraldry



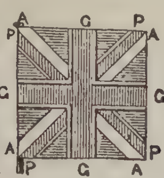


Fig. 1. Fig. 2.

G, St George's Cross; A, St Andrew's Cross; P, St Patrick's Cross.

forms the second and now existing union ensign (fig. 2). Generally speaking, it is displayed as a national ensign on flags only; but the reverse of the bronze coins of the realm contains a not very accurate representation of it on the shield of the seated figure of Britannia. The inaccuracy consists in the crosses of St Andrew and St Patrick being made to assume the appearance of a single saltire with a narrow border of equal width on each side.

UNITA'RIANS, a name applied generally to all who maintain that God exists in one person only, and specially to a small Christian sect of recent times, whose distinguishing tenet is the Unity as opposed to the Trinity of the Godhead. In the more general sense, the name of course includes the Jews and the Mohammedans as well as those Christians who deny the doctrine of the Trinity, and in this sense also there have been U. from the earliest period of ecclesiastical history. Until the middle of the 2d c., there seems to have been no controversy upon the subject; but from that time to the end of the 3d c., there was a succession of eminent teachers who maintained, against the ecclesiastical doctrine of the Logos, the undivided unity—or, as they expressed it—the *Monarchy* of God. From their use of this word, they are known in ecclesiastical history as the Monarchians. There are generally understood to have been two classes of them—those who taught that Christ was God in such a sense that it was the Father who became man, and was born and suffered, and who were, on this account, called by their opponents Patripassians; and secondly, those who held that Christ was in nature a mere man, but exalted above all other prophets by the superior measure of Divine wisdom with which he was endowed, and who therefore corresponded more nearly with the modern Unitarians. It is right to notice, however, that the doctrines of the Monarchians are known to us only through the statements of opponents, and it is probable they would have disowned the more extreme views ascribed to them. To the former of the two classes we have mentioned belonged Praxeas, against whom there is a treatise by Tertullian, and Noetus; and at a later period—about the middle of the 3d c.—the famous Sabellius taught very similar doctrines. The other class was represented by Theodotus, Artemon, and especially Paul of Samosata, Bishop of Antioch, who was eventually deposed on account of his heresy. Beryllus, Bishop of Bostra in Arabia, who is said to have been convinced of his error by Origen, would seem, from the single sentence which records his teaching, to have belonged to this class rather than the other. The Monarchians appealed in support of their doctrines to the Old and New Testaments, and to the early opinions of the church. They are said, by Tertullian, to have consisted of the simple and the unlearned—'always,' he adds, 'a majority of the faithful'—a statement which shews that they must have been tolerably numerous in his time; while a writer quoted by Eusebius brings against them the apparently opposite charge of being students of geometry and lovers of Aristotle.

The grand theological struggle which followed in the 4th c. between the Arians and the Athanasians may be regarded as but another phase of the Unitarian controversy, inasmuch as Arius held that the Son was a created being, and denied his consubstantiality with the Father. On this head, the reader may consult the articles ARIUS and ATHANASIUS. We now pass on to the post-reformation period.

It is not strange that in the great stir of thought which accompanied the Reformation, some should have been found bold enough to question the grand catholic doctrine of the Trinity. Such there were even before the Socini. See SOCINUS. Among the earliest may be mentioned Hetzer and Bassen, both of whom were executed in 1529, the former, however, not exclusively for his religious opinions; Denck, Campanus, and the famous Spaniard, Michael Servetus (q. v.). So widely, indeed, was the Unitarian doctrine diffused that it was thought necessary, in the first article of the Augsburg Confession, to condemn the modern Samosatans, who deny the personality of the Word and Spirit, declaring the former to be a proper spoken word, and the latter a divine influence; and as early as 1527, one Andr. Althamer published a work against 'the modern Jews and Arians under a Christian name, who deny the Deity of Christ.' Under the influence of the elder Socinus, Unitarianism gained many adherents in Venetia. Poland and Transylvania, however, became its principal strongholds, and in those countries, favoured by circumstances, it struck the deepest roots. In Poland, the nobility, protected from persecution by their class privileges, proved singularly favourable to a movement which seemed more destructive of the traditions of the Catholic Church than any that had yet been entered upon; the Unitarian refugees from other countries found here a ready welcome; and in the reign of Sigismund II. (1548—1572), this party of reformers was strong enough to form itself into a separate church. At a rather later period, Poland was the principal field of labour of the younger Socinus, and Unitarianism continued to flourish there till the middle of the 17th c., when, under John Casimir, who before his elevation to the throne had been a cardinal and a Jesuit, it was extirpated by force. In Transylvania, the U. have succeeded in maintaining their existence, notwithstanding much opposition and persecution, from the Reformation to the present day. The first who openly preached Unitarianism in that country were George Blandrata and Francis Davidis (1565), and under the influence of these distinguished men, large numbers, including the king himself, embraced the new opinions. But this period of prosperity was not of long duration. In 1572, though still permitted to worship according to their conscience, the U. were forbidden to make any attempts at propagandism, or even to print their religious books. They were not, however, subjected to any violent persecution until after the incorporation of Transylvania with the Austrian Empire, which took place in 1690; but after that time they were robbed by the Roman Catholics of all their churches and church property, forbidden to build new churches without the permission of the emperor, and by degrees excluded from all government offices, even the very lowest. On the accession of Joseph II., happier times returned. Their churches were forbidden to be seized, and an indemnity was even paid them for the loss of the

cathedral church of Klausenburg. They were now enabled to build new churches, and their cathedral and college at Klausenburg are said to be still two of the finest buildings in that city. The U. of Transylvania number about 56 000, and are said to be increasing. They have an organised system of church government, with a bishop at its head. They have three colleges—that of Klausenburg, with 12 professors and 273 students; that of Torda; and that of St Keresztur.

In England, Unitarian opinions were somewhat later in making their appearance than on the continent. As early, indeed, as 1548, a priest named John Ashton was accused of Arianism, and escaped with his life only by recantation; and during the reigns of Edward VI., Mary, Elizabeth, and James I., a few suffered martyrdom on similar charges. But during the reign of James I., continental Socinianism began to exercise considerable influence in England, and continued to do so to the end of the century, so much so that, in 1665, Dr Owen wrote that 'the evil is at the door, that there is not a city, a town, scarce a village in England, wherein some of this poison is not poured forth;' and how deeply the Church of England was infected with it may be inferred from the no doubt exaggerated statement of Palmer, who, in 1705, spoke of 'troops of Unitarian and Socinian writers, and not one dissenter is found among them.' Many eminent men of the time, including Milton, Locke, and Newton, and in the next century, the famous apologist, Lardner, must be numbered among the U.; but it was in the last decade of the 17th c. that the controversy on this subject was most active, and at this time were published the old Unitarian tracts—a series of anonymous writings marked by eminent learning and talent. Hitherto, however, the U., with the exception of the society formed in London by John Biddle (q. v.), which did not survive its founder, had no organised existence. But after the passing of the Toleration Act in 1689, whereby Nonconformity was made legal, the way was prepared for that gradual change by which the orthodoxy of the English Presbyterians passed into Unitarianism. It was at this time that most of the old Presbyterian chapels were founded, and the trusts being open —i. e., not committed to any doctrinal system—ministers and people were left free to adopt and promulgate whatever new opinions should approve themselves to their conscience. Thus, the U. are the legitimate successors and representatives of the 2000 Presbyterian divines who in 1662 left the Church of England in consequence of their inability to comply conscientiously with the terms of the Act of Uniformity. The ground of this separation, it should be understood, was no difficulty about the doctrinal articles of the establishment. The English Presbyterians (so called from their preference for that form of church government, for they were never able to adopt it) were originally as orthodox as their Episcopal brethren; but having refused to commit themselves to any authoritative creed, they underwent a gradual change to Arian, and at length to Unitarian, views. Many preached such views without exciting attention or controversy, and indeed, until 1813, the law which made it blasphemy to speak against the Trinity, though not strictly enforced, was still in existence. During the latter half of the 18th c., Dr Priestley (q. v.) appeared as the champion of the humanitarian view of Christ's nature, and, by the influence of his writings, secured the more open advocacy of that doctrine. In 1774 Dr Lindsey resigned his charge in the Church of England, and became pastor of the Unitarian congregation of Essex Street, London—an event which may be regarded as an epoch in the history of English Unitarianism. In 1813, the U. were placed by law fully on a par with other dissenters, and since that time there has been no attempt at persecution, with the exception of the claim made to some of their properties by certain orthodox dissenters. This claim was met by the Dissenters' Chapels Act in 1844. The U. of England and Wales are purely congregational in their church government, their only organ for combined action being the British and Foreign Unitarian Association, which holds its meetings annually in London. Their principal place of education is Manchester New College, London, which is, however, an unsectarian institution. They have also a missionary college in Manchester and the Presbyterian College, Caermarthen, educates Independent and Unitarian ministers. They have at present (1866) about 314 chapels and mission stations.

In Scotland, the religious atmosphere has never been very favourable to Unitarianism. It was in that country that the last execution for blasphemy against the Trinity took place in the person of the unfortunate Aikenhead. Nevertheless, towards the close of the 18th c., there was a certain amount of Arianism among the Moderates in the Church of Scotland. Unitarianism, as a distinct system, was preached at Montrose as early as 1783; and at the beginning of the present century, some attempts were made to diffuse it by means of missionary efforts. There are now five congregations in the country. That at Edinburgh was originally a branch from the Cameronians, the strictest of Calvinists, but having adopted the principle of free inquiry, they gradually embraced Arian, and eventually humanitarian, views. This last change took place during the ministry of the late Dr Southwood Smith, about the year 1812.

In Ireland, the history of Unitarianism is intimately connected with that of Presbyterianism. It flourishes principally in the north of the island, where there is a strong infusion of Scotch blood, and where Roman Catholicism has the least influence. There are about 40 congregations. The U. of Ireland are Presbyterians in fact as well as in name.

Unitarianism in the United States has passed through much the same phases as in Great Britain. After 1740, Arian views of the person of Christ were pretty widely diffused among the New England clergy; and in 1787, took place the first secession from the Episcopal Church, on the ground that those parts of the liturgy which imply a belief in the Trinity could not be any longer employed. From the first, the New England churches were remarkably free from the restraints of tests and creeds, and were thus prepared for the adoption of a liberal theology. By imperceptible degrees, many of them glided into Unitarianism; but it was not until about 1815 that the name began to be much used. At that time, the influence of Dr Channing (q. v.) was thrown into the scale; and since then, Massachusetts, and particularly Boston, has been the stronghold of Unitarianism in America. The U. have about 256 societies in the States, and upwards of 20 in Boston alone. Harvard University, Cambridge, is not a denominational institution; but it is at present in the hands of the U., and most of their ministers are educated either there or at the Meadville Theological School, Pa. Besides the U., properly so called, the Universalists, the 'Christians' of America, and the Hicksite Quakers, are understood to hold anti-Trinitarian sentiments, though they give no special prominence to the doctrine of the Divine Unity. When we have mentioned, further, that there are a few Unitarian churches in the principal colonies of Great Britain, we shall have made a sufficiently complete enumeration for the purposes of

this sketch. We have, however, to add, that Unitarian sentiments, under the names of Liberal Christianity and Rationalism, are more or less widely diffused in France, Switzerland, Germany, and Holland.

We now proceed to give a brief sketch of the theological opinions by which U. are distinguished from other Christian sects. It is, of course, impossible that we should notice all the phases of belief they have passed through since the Reformation. We confine ourselves to stating the more important doctrines of the early Socinians, as they are set forth in the Racovian Catechism, and sketching rapidly the opinions of the modern U. of England and America.

The Socinians assumed, as the fundamental principle of their theology, the sufficiency of Scripture, or rather of the New Testament, which, they held, had, for all matters of faith, superseded the Old. According to their system, Christ was a true man, but conceived of the Holy Spirit; and on account of the Divine power which he has received from the Father, and his exaltation as head over all things, he is to have worship offered to him. The Holy Spirit is not a person, but a Divine influence. The Socinians rejected also the doctrine of original sin. Man, they taught, was created with a mortal nature, but by the special gift of God, was endowed with a conditional immortality. He was created innocent, but not positively righteous. The gift of immortality he forfeited by disobedience. The fall of Adam, however, being a single act, could not deprave his own nature, much less that of his posterity; and in the latter, death was not a consequence of the fall, but was simply the condition of birth and life. Thus, the actual consequence of Adam's fall was not any radical corruption of human nature, whereby it was impossible for man to do any good thing, but rather a moral deterioration, producing, with repeated acts of disobedience, an increasing tendency to sin. Man, after the fall, retained his free will, and the power of abstaining from sin if he so pleased. On the question of the merits of Christ, the Socinian doctrine was essentially different from that of all the other Protestant sects. Christ's merits did not consist principally in his death, but in his life, his teachings, and his example. Nor was his death regarded as an atoning sacrifice, or as having any vicarious efficacy whatever, but simply as a confirmation of God's will, and the seal of the new covenant. Christ died for our sins—first, that all sinners might in this way have the assurance of forgiveness and of eternal life; secondly, that they might be drawn to Christ, and led to seek through him alone remission of their sins; and thirdly, that God might thus testify His boundless love to the human race, and might reconcile it to Himself. But the crucifixion was important chiefly as preparing the way for the great crowning miracle of the resurrection. Here, in fact, not Christ's death, but his resurrection, is the central point of the Christian scheme. By this he confirmed his doctrine of immortality, and prepared for his ascension into heaven, where he now fills the office of our great High Priest. Jesus 'frees us from the punishment due to our sins, in that he continually protects us by the virtue and power which he has received from the Father, and by his intervention, defends us, as it were, from the wrath of God; and he frees us from servitude to our sins, by drawing us away from every kind of vice, and shewing us in his own person the reward of him who abstains from sin.' Predestination in this system means the decree of God, made before the foundation of the world, that they who believed and were obedient should be saved, and that they who believed not and were disobedient should be damned. Justification takes place when God pardons our sins and gives us eternal life. The Socinians regarded the sacraments as simply external signs testifying to Christian faith. Hence they held infant baptism to be irrational as well as unscriptural, but thought that a custom so old and established should be tolerated.

It need scarcely be said that the systematic theology of the early Socinians is in this country quite a thing of the past; indeed, the English U., though undoubtedly more or less influenced by their continental brethren of the Reformation period, have with the latter no very direct historical connection. They seem rather to have arrived at independent conclusions, through their 'rational' interpretation of Scripture, and their consistent rejection of human authority in matters of faith. The U. of the present day, like almost all Christian sects, must be divided into two classes—a conservative and a progressive class—or, as they are often called, an old and a new school. The former adopt the old rule of the sufficiency of Scripture, though with many such qualifications as the scientific criticism of the Bible has rendered indispensable. The most conservative U., for example, would not contend for the literal truth of the first chapter of Genesis, nor for the doctrine of verbal inspiration in any shape. The Bible *is not*, but it *contains*, the Word of God, is the form which best expresses their position on this subject. They generally hold the simple humanity of Christ, and even reject the supernatural birth, thinking the part of the gospels which record that event to be less authentic than the parts referring to the ministry, the death, and resurrection of Jesus. To the death of Christ they ascribe much the same kind of efficacy as we have seen was ascribed to it by the Socinians, regarding his teaching and example as the most essential part of his work, and his death as an attestation to the truth of his mission, and a preliminary to his resurrection. What, however, chiefly distinguishes the U. of this school from those of the new or progressive school, is the place which they give to the miracles as supernatural sanctions of the truth of Christianity. In this respect they must be considered as still under the influence of Locke's philosophy and the theology of Dr Priestley. Denying that man has any immediate knowledge or intuition of spiritual things, they regard Christianity as a system of moral and religious truth external to man's nature, and requiring, in proof of its Divine origin, certain evidence beyond its inherent credibility and adaptation to human wants. This evidence they find in the miracles, which they accept as well-attested facts, on the same ground on which all historical facts are accepted. 'If there be any truth in history,' says Dr Priestley, whose influence can still be traced in the U. of this school, 'Christ wrought unquestionable miracles, as a proof of his mission from God; he preached the great doctrine of the resurrection from the dead; he raised several persons from a state of death; and, what was more, he himself died and rose again in confirmation of his doctrine. The belief of these facts I call the belief of Christianity.' According to this view, therefore, Christ is an ambassador from heaven to earth; the miracles he wrought are his credentials; and the moral and religious truths which he taught are his message. It is not indeed denied that many or all of those truths might be learned from the light of nature, but they have received from Christianity a sanction which gives them a greater degree of certainty than they could otherwise possess. The U. of the progressive school, on the other hand

have abandoned the philosophy of Locke for more spiritual modes of thought. So far from regarding man as entirely dependent upon his reasoning powers for his knowledge of religion, they rather look upon him as standing in a living relationship with the one infinite source of all truth, and as having within his own nature the germs of the highest religious faith. Christianity, accordingly, they regard not as a *message* or a system of truth communicated and authenticated from without, but as the highest expression of the Divine in humanity —an expression not necessarily preternatural, but connected with the previous history of mankind by the natural laws of moral and spiritual development. To this view of Christianity, the miracles are not felt to be essential as proofs; and the truths of the gospel are thought to be quite unaffected by any judgment regarding them. The U., however, of this school, while, from their point of view, they regard the question of the miraculous as one of critical rather than religious interest, yet generally accept the miracles as historical facts, considering that there is sufficient evidence to prove that they took place. A few, but an increasing number, agree with Theodore Parker and many of the German critics in rejecting them on the twofold ground, that they are intrinsically incredible, and that the evidence for them is conflicting and uncertain. Generally speaking, the U. of this school, like the so-called Broad Church men, are disposed to regard with favour the freest criticism of the Bible. Holding that inspiration is a quality which is not peculiar to the Bible, but common to all the most elevated religious literature, and that it in no case implies immunity from error, they maintain that the Scriptures must be subjected to the same rules of criticism and interpretation as any other book, and that each book of Scripture is to be studied not as a collection of infallible oracles, but as a record of the mind of the age in which it was produced. In this light, however, and also as a record of the grandest religious movements of the world's history, they hold the Bible in the highest estimation. Such is a statement, necessarily imperfect, of the peculiarities of the two Unitarian schools in their extremest divergence from one another; it need scarcely be added that in fact they merge into each other by imperceptible gradations.

It will, of course, be understood that the U. of all shades of opinion are agreed in rejecting the entire orthodox scheme—including the doctrines of the Trinity, the vicarious atonement, the Deity of Christ, original sin, and everlasting punishment—as both unscriptural and irrational. They celebrate the Lord's Supper in their churches, not as a sacrament, but as a service commemorative of Christ's death, and expressive of spiritual communion with him. They also adhere generally to the rite of infant baptism, though there are a few Unitarian Baptist churches. In recent years, the U. have given renewed prominence to the principles of Comprehension and of Free Inquiry apart from the restraints of theological creeds, conceiving that in this they are conforming to the spirit of their Presbyterian forefathers; and many even object to the name Unitarian, as one which might be held to imply a doctrinal bond of union, and to be, to that extent, inconsistent with the fundamental principles of the body, which both now and in former times have always included unrestricted freedom of religious thought. It is impossible here to explain at greater length the Unitarian position; but it may be mentioned, as an important fact, that when, at the meeting of the British and Foreign Unitarian Association held in 1866, it was proposed to add to the rules a clause defining 'Unitarian Christianity,' the motion was almost unanimously rejected. The motion was intended as a protest against anti-supernaturalism. Its rejection, on the other hand, was an assertion of the principle of comprehension and freedom, and was voted for by those who sympathised doctrinally with the proposer, as well as by those who differed from him.—For fuller information on the history and doctrines of the U., the reader may consult Dr Beard's *Unitarianism in its Actual Condition;* the Rev. J. J. Tayler's *Religious Life of England;* Otto Fock's *Socinianismus;* and Lange's *Geschichte und Lehrbegriff der Unitarier vor der Nicänischen Synode.*

UNITED GREEKS. See GREEK CHURCH.

UNITED PRESBYTERIAN CHURCH, the name of a religious body in Scotland, which was constituted in 1847 by the amalgamation of the SECESSION and RELIEF CHURCHES, whose origin and history we propose briefly to narrate.

The SECESSION CHURCH.—The causes which led to the formation of the Secession Church, in order to be thoroughly understood, would require to be unfolded at much greater length than our space permits. But some notice of them, however brief, is absolutely necessary. It is well known that the Reformation from popery in Scotland was a very radical and decisive affair in regard to both the doctrine and government of the church. The people became strongly Calvinistic and Presbyterian; and after the accession of James to the English throne (1603), their attachment to their ecclesiastical system became stronger still. The efforts of that monarch to supplant it by Episcopacy proved unavailing, so far as the great body of the commons and gentry were concerned; but moved by various considerations, into which religious conviction entered only as a very subordinate element, many of the Scottish nobles adopted the church principles of their sovereign, and after the Restoration (1660), supported the governments of Charles and James in their persecution of the Covenanters. See COVENANTS; SCOTLAND; SCOTLAND, CHURCH OF. At the meeting of the Scottish Estates in 1690, Episcopacy, which, in Scotland, had obtained a temporary supremacy under the rule of Sharp (q. v.) and Lauderdale, and had, besides, become synonymous with adherence to the House of Stuart, was abolished, and Presbyterianism re-established. One unavoidable consequence of this was the abolition of the *right of patronage*, for in a multitude, probably the great majority, of cases, the exercise of this right would have placed the nomination to ecclesiastical benefices in the hands of Episcopalian landholders, and thereby imperilled the existence of a sound Presbyterian ministry. But although there were still many zealous Presbyterians in Scotland, especially among the peasantry, the spirit of the nation as a whole had gradually undergone a great, and, in the opinion of some, a disastrous change, so far as religion was concerned. A kind of torpor seized the upper and middle classes after the 'glorious Revolution,' and earnestness growing unfashionable, was sneered at as fanaticism. A proof of the latitudinarianism of the times is the fact, that some hundreds of Episcopalian curates were allowed to retain the parishes in which they had been arbitrarily stationed, on subscribing the *Confession of Faith;* and great numbers of laymen became elders in a church whose strict adherents they had themselves but recently hunted even to death. This obtrusion into the church of curates whom Bishop Burnet describes as 'the worst preachers I ever heard, ignorant to a reproach, and many of them openly vicious, produced, as may easily be conceived, a pernicious

influence on the purity of ecclesiastical discipline; and in 1712, when the obnoxious *Law of Patronage* was restored, the triumph of the court of 'moderate' party in the church may be regarded as complete. See MARROW CONTROVERSY. Violent settlements, effected by the agency of dragoons, now became frequent, and greatly irritated the people, whose petitions and appeals were almost invariably disregarded; and finally, in 1730, the Assembly enacted that in future no reasons of dissent 'against the determinations of church judicatures' should be entered on record. This attempt to gag the mouths of congregations was more than some could bear, and in October 1732, the Rev. Ebenezer Erskine of Stirling, in a sermon delivered in his capacity of moderator before the synod of Stirling and Perth, denounced in solemn and impassioned words the recent legislation and spirit of the church. A committee was immediately appointed to consider the matter, and reported rather vaguely but unfavourably at the ensuing meeting of synod; in consequence of which, Mr Erskine, after three days' 'warm reasonings,' was found deserving of censure by a majority of six. He immediately protested (as did also twelve other ministers and two elders), and appealed to the next General Assembly, which sustained the decision of the synod, and ordered the rebuke and admonition to be administered, 'in order to terminate the process.' Erskine, of course, had to submit to censure, but left a written protest on the table of the Assembly, in which he declared his intention to continue testifying against the 'defections' of the time. This protest was also signed by William Wilson, minister of Perth; Alexander Moncrieff, minister of Abernethy; and James Fisher, minister of Kinclaven. The Assembly was indignant, and next day ordained 'that the four brethren appear before the Commission in August next, to express sorrow for their conduct, and retract their protest;' on pain of being suspended from their ministry. This they refused to do, and in consequence were declared 'no longer ministers of the church' (November 1733), whereupon they handed in a final written protest, in which, after referring to the 'defections from our reformed and covenanted principles' of the 'prevailing party,' they protested that they were obliged TO MAKE A SECESSION FROM THEM, and appealed unto the first free, faithful, and reforming General Assembly of the Church of Scotland.

This was the origin of the famous 'Secession Church,' which has made so deep an impress on the religious life of Scotland. At first composed of only four ministers, it rapidly began to gather strength. Little Christian societies were everywhere formed, which were gradually supplied with pastors either from the Establishment, or from pious youths trained to the work of the ministry by Erskine and his friends. Erskine and his friends drew up a statement of their reasons for separation, which was published under the title of *A Testimony to the Doctrine, Worship, Government, and Discipline of the Church of Scotland, or Reasons (by the Four Brethren) for their Protestation entered before the Commission of the General Assembly.* This document, which afterwards came to be known as the 'First or Extra-judicial Testimony,' presented in a polemical or argumentative form those facts in the later history of the Church of Scotland at which e have already glanced; and is of great value ith reference to a proper understanding of the rounds of secession. From it we learn that it was *not* one thing only, not even the unpopular law of patronage' (as has sometimes been carelessly imagined and asserted), that induced Erskine and his friends to leave the church of their fathers; but an accumulation of grievances that in their eyes had become insupportable. In short, the Secession Church had a *religious*, and not a *political* origin. What the 'four brethren' sought was the vindication of what they held to be evangelical truth, much more than of the mere right of 'popular election.' So much popular indignation was excited by the deposition of the 'four brethren,' that it was thought desirable by the majority of the 'Moderate party' to make certain concessions to the 'Evangelicals,' or 'Marrow party,' lest the spirit of insurrection should grow, and perhaps overturn the Establishment. Accordingly, the General Assembly of 1734 passed some measures distinctly favourable to the latter party, and curiously contrasting with their former procedure; and finally, on the last day of the sittings, empowered the 'synod of Perth and Stirling' to remove the censures from the four brethren, and to restore them to their respective charges. This was done; and to shew how far their new-born cordiality could go, the synod proceeded, in Mr Erskine's absence, to elect him 'moderator;' but Mr Erskine declined to be 'reponed,' and gave his reasons in a letter to the Stirling presbytery, and in a pamphlet subsequently published. In December 1736 appeared the pamphlet entitled *An Act, Declaration, and Testimony for the Doctrine, Worship, Discipline, and Government of the Church of Scotland*, commonly known as the 'Judicial Testimony,' which is a sort of survey of the whole ecclesiastical history of Scotland from the Reformation downwards, in which all the 'instances of defection and relapse are marked and judicially condemned.' In 1737, the Rev. Thomas Mair of Orwell, the Rev. Ralph Erskine of Dunfermline, the Rev. Thomas Nairn of Abbotshall, and the Rev. James Thomson of Burntisland, joined the original 'four.' The church authorities, filled with anger and alarm, now resolved to proceed to extremities against the seceders. In 1738, the 'commission,' obeying the injunctions of the Assembly of that year, libelled the 'Eight Brethren,' and summoned them to appear before the Assembly of 1739, which they did—having, however, first drawn up and passed an act entitled a *Declinature*, in which they disclaimed the authority of the Established courts. One final effort was made by the Assembly to bring them back to the bosom of the church, but it failed—the 'brethren' adhering strictly to all their former protestations and testimonies; and after a 'year of grace,' the General Assembly of 1740 solemnly pronounced their deposition, and the connection between Erskine and the church of his fathers was for ever at an end.

It is not necessary to describe minutely the gradual extension of the 'Secession movement' among the people of Scotland, but we may mention, that in spite of the frequent refusal of sites for churches, and other modes of persecution, the cause abundantly prospered; and after a few years, the 'Secession Church' came to be recognised as a really important body, both from the number of its congregations, and the grave, serious, and solid character of its members.

In 1747, a rupture or 'breach' took place in the new body on the question of the burgess-oath, some affirming that this oath could not be taken by any consistent Seceder, and others insisting that it could, and that the question regarding it ought to be matter of mutual forbearance. The party condemning the religious clause in the burgess-oath formed the *General Associate Synod*, or popularly the *Anti-burgher Synod;* the party tolerating it, the *Associate* or *Burgher Synod.* Subsequently, a second split occurred in each of these, and two other trivial denominations were

formed, the one assuming the designation of the *Constitutional Associate Presbytery*, or *Old Light Anti-burgher* (1806); and the other, the designation of the *Original Burgher Presbytery*, or *Old Light Burghers* (1799). After holding aloof from each other for more than 70 years, the Burghers and Anti-burghers began to approximate once more, and finally, on the 8th September 1820, in Bristol Street meeting-house, Edinburgh, the synods of the two long separated branches of the Secession were solemnly re-united. At the date of the 'breach' (1747), the number of Secession congregations was 32; when the reunion took place, it had increased to 262. Henceforward, the history of the Secession Church exhibits a course of uninterrupted prosperity. A certain change, however, now begins to shew itself in the character and spirit of the denomination. Hitherto, Seceders had worn a sort of *old-world look*, if we may use these words respectfully; their thoughts and interests in matters ecclesiastical centred round bygone times and events; their very language, like their sentiments, was archaic, and fell coldly upon all but the devoutest ears. Now, however, the wants of the modern world made themselves felt even in the narrow circles of Scotch dissent. In a word, they came under the liberalising influences of the new-born enthusiasm for foreign missions, and started 'stations' in Canada, Jamaica, Trinidad, Calabar, &c. So vigorously was this important branch of Christian work carried on, that in 1847, at the period of the union of the Secession and Relief Churches, the former was found to be supporting a staff of more than 60 missionaries in different parts of the world. Further, the *Secession* Church began to assume an attitude more distinctly antagonistic to the Establishment. Though it has never formally avowed the *voluntary* principle (see VOLUNTARYISM), yet the fact that it has maintained itself *ab initio* by voluntary effort, has had the effect of determining the great majority of the pastors and people to adopt this principle. A variety of circumstances, partly political and partly ecclesiastical, led to a great controversy between leading divines of the Establishment and of the Secession, known as the *Voluntary Controversy* (1829—1834), which served to strengthen the voluntaryism of the Seceders, and brought them more closely into connection with the Relief Church (see below), whose theoretical voluntaryism was perhaps still more pronounced. Next followed the famous *Atonement Controversy*, in which the Secession Church signalised itself by an adherence to the liberal evangelical theology of the Marrow, and on this vital point also it had the sympathy and support of the Relief body. The desire for union between the two denominations now became stronger than ever. Committees were appointed, and conferences held; and at length on the 13th May 1847, in Tanfield Hall, Edinburgh, the union of the Secession and Relief was formally accomplished, and the two churches, abandoning the names by which they had hitherto been known, formed themselves into one body under the designation of the UNITED PRESBYTERIAN CHURCH.

We now revert to the RELIEF CHURCH, whose history and fortunes we shall briefly narrate. After the expulsion of Erskine and his friends from the Church of Scotland, the assemblies (packed with 'Court of Session elders') became more determinedly 'moderate' than ever. The split that occurred among the Seceders in 1747 convinced them that they had now little to fear from the aggressive zeal of their opponents, who had taken to quarrelling among themselves; and, desiring to stand well with government for various reasons, they boldly resolved to deprive the people of all right to elect, or in any way to interfere with the election of, ministers. Never were forced settlements more shameless than about this period; but it has been well remarked, 'there is a point at which oppression becomes intolerable; and to a religious people, no oppression is half so galling as that which is spiritual.' *Relief* was felt to be a necessity, and relief came in the person of the Rev. Thomas Gillespie, minister of the parish of Carnock, near Dunfermline. The circumstances which brought him into collision with the General Assembly were these: In 1749, the Rev. Andrew Richardson was presented to the parish of Inverkeithing by the patron, Captain Philip Anstruther; but the presentation proved so extremely unpopular that the presbytery of Dunfermline refused to proceed with it. In 1750, the case came before that high-handed body, the 'Commission of the Assembly,' who ordered the presbytery to proceed at once to induct Mr Richardson. This mandate they firmly refused to obey; and when, after much discussion, the affair again came before the Commission in March 1752, it was resolved to transfer the onus of the unpopular settlement from the shoulders of the presbytery of Dunfermline to those of the synod of Fife. This compromise did not satisfy the out-and-out Moderates in the Church of Scotland. It was therefore resolved to make an example of the presbytery of Dunfermline at the ensuing Assembly. On 18th May, the 'Inverkeithing case' came on, and after a brief but animated debate, the conduct of the 'Commission' was condemned by the Assembly without coming to a vote; the presbytery of Dunfermline was ordered to induct Mr Richardson on Thursday the 21st, and on the day following to appear at the bar of the Assembly. The presbytery did *not* meet on Thursday—at least a *quorum* did not—and Mr Richardson was consequently not inducted. On Friday, six ministers of the presbytery—Robert Stark, David Hunter, Thomas Gillespie, Alexander Daling, Thomas Fernie, and John Spence—handed in a 'representation,' explaining why they could not obey the commands of the supreme court. They were warned by the moderator of the danger in which they stood, and were finally informed that if they remained obdurate, *one* of them should be deposed. Next day, they were called in *singly*. Stark, Fernie, and Hunter all wavered and shifted their ground a little; Daling and Spence said nothing; but Gillespie was ready with a second 'representation.' This was enough. Gillespie was fixed on as the most suitable sacrifice, and almost without trial, without a libel or any formal process whatever, he was arraigned, cast, condemned, and deposed. The majority of the General Assembly, corrupt as its composition undoubtedly was, seems to have shrunk from active participation in the deed. Out of 158 members present, only 56 ventured to vote, and these, it must be remarked, were mainly lawyers!

The *Relief Church*, it will thus be seen, was founded simply on an assertion of the right of congregations to elect their own ministers. In 1758, Mr Thomas Boston, junior, minister of Jedburgh, and son of the great Boston, threw in his lot with Gillespie; in 1761, the congregation of Colinsburgh, in Fife, did the same. The Relief had now got a footing, and steadily increased. 'Societies' (as in the case of the Seceders) sprung up everywhere, which were gradually formed into congregations, and obtained ministers from the Establishment, the Secession, the Reformed Presbytery, and the English Presbyterians; nevertheless, they had long to sustain a severe fire of attack from the Seceders and Reformed Presbyterians, on account of their firm adherence to the latitudinarian principle of free

communion,' i. e., of holding Christian fellowship at the Lord's table with other denominations. It is unnecessary to prosecute the history of the Relief further than to state that at the union in 1847 it numbered 113 congregations; while the Secession numbered 384 congregations, so that the UNITED PRESBYTERIAN CHURCH commenced with 497 churches, and a membership estimated at more than 140,000.

UNITED PRESBYTERIAN CHURCH.—The career of this church as a corporate body has been one of uninterrupted prosperity, and scarcely more is necessary than to indicate its present attitude and condition. In point of doctrine, it adheres (like all the other Presbyterian churches of Scotland) to the Westminster Confession of Faith, and the Larger and Shorter Catechisms, 'it being always understood that we do not approve of anything in these documents which teaches, or may be supposed to teach, compulsory, or persecuting and intolerant principles in religion'—a qualification supposed to refer more particularly to the 23d chapter of the Confession of Faith. Its form of church government is Presbyterian; but, unlike the Established and Free Churches, it has no intermediate courts between presbyteries and the supreme court, the latter of which it does not call a General Assembly, but only a synod; though, in point of fact, it partakes more of the nature of a 'General' Assembly than the bodies known by that name, since it is really an assembly of the whole clergy of the denomination, with one elder from each kirk-session. It has a Theological Hall and Library in Edinburgh, and a staff of professors. The United Presbyterian Church is also at present, not only in *practice*, but also in *theory*, a voluntary church. The voluntary principle, it is true, is not formally laid down in any portion of her standards or 'Basis of Union,' for, as we have seen, neither the Secession nor the Relief was founded on this principle; but a long experience of practical voluntaryism has finally led, one may almost say, the whole body of United Presbyterians to the conviction that the interests of Christianity are best served by the total separation of the church from the state.

Although inferior in point of wealth to the Established and Free Churches, the United Presbyterian Church has honourably distinguished itself by the general liberality, and the occasional munificence, of its support of the various 'schemes' by which its rulers endeavour to make it an efficient agent in the maintenance and propagation of 'pure and undefiled religion.' In 1873, it had 611 churches, and 182,810 members.

UNITED PROVINCES. See NETHERLANDS (*History*).

UNITED STATES OF AMERICA, a federal republic, composed of 38 sovereign states and 11 territorial governments, occupying the temperate portion of North America, from lat. 24° 20′ to 49° north, and long. 66° 56′ 48″ to 124° 30′ west long.; bounded on the N. by British North America; E. by New Brunswick, the Atlantic Ocean, and the Gulf of Mexico; S. by the Gulf of Mexico and Mexico; and W. by the Pacific Ocean; also the outlying territory of Alaska (q. v.), extending from lat. 52° 2′ to 71° 27′ N., and from long. 130° 25′ to 187° 36′ W., forming the N.W. extremity of North America. Its greatest length, from the Atlantic to the Pacific, on the parallel of 42°, is 2768 miles, and its greatest breadth, from Point Isabel, Texas, to the N. boundary near Pembina, is 1601½ miles. The northern frontier is upward of 3350 miles in length, the Mexican 1500 miles. The ocean coast, including the larger indentation, is estimated at 12,609 miles, of which 6861 are on the Atlantic, 3461 on the Gulf of Mexico, 2281 in California, 8000, including bays and islands, on the border of Alaska, and 2000 on the Arctic Sea. Total area, 3,607,604 sq. miles or 2,308,866,560 acres.

This area has been obtained by successive annexations of territory, either by purchase, right of discovery, or conquest. In 1783, the territory ceded by Great Britain was confined to the country east of the Mississippi River, and north of Florida, having an area of 815,615 square miles. To this Louisiana was added by purchase from France in 1803, 930,928; Florida, ceded by Spain in 1821, 59,268; Texas, annexed in 1845, 247,356; Oregon, as settled by the treaty of 1846 (163,446 sq. m. having been yielded to Great Britain), 280,425; California, &c., conquered from Mexico, 1847, 649,762; New Mexico, &c., by treaty with Mexico, 1854, 27,500; and Alaska, by purchase from Russia, 1867, 577,390 sq. m.

The 38 states composing the federal republic, each having its constitution, legislature, executive, and judiciary, and represented in the Federal Council by two senators, and from one to thirty-three representatives, according to its population, together with the territories (in italics) not yet recognised as states, are the following: Sixteen Atlantic states and one district, Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, *District of Columbia*, Virginia, North Carolina, South Carolina, Georgia, and Florida: the 4 Gulf states, Alabama, Mississippi, Louisiana, and Texas: the 12 Mississippi valley states, Michigan, Wisconsin, Minnesota, Iowa, Ohio, Indiana, Illinois, Missouri, West Virginia, Kentucky, Tennessee, and Arkansas: the 4 states and territories of the Plains, *Dakota*, Nebraska, Kansas, *Indian*: the 8 Rocky Mountain states and territories, *Montana*, *Idaho*, *Wyoming*, Colorado, *Utah*, Nevada, *New Mexico*, and *Arizona*; and the 4 Pacific states and territories, *Washington*, Oregon, California, and *Alaska*. Eight of the above are organized territories under the control of Congress, their governors and judiciary being appointed by the President of the United States: they have a local legislature and send a delegate to Congress, who, however, has no vote therein. The remaining are known as the *Indian Territory*, which embodies a tract of land set apart by the government as a permanent home for several aboriginal tribes, mostly removed thither from east of the Mississippi, the territory of *Alaska*, and the *District of Columbia*. The District of Columbia originally embraced an area ten miles square situated on both sides of the Potomac, ceded to the United States by Maryland and Virginia and accepted in 1790 as a seat of government. The portion lying west of the Potomac was retroceded to Virginia in 1846 and the area was reduced to about 60 sq. m.

For full descriptions of these states and territories the reader is referred to the articles respectively.

The following table gives the dates of admission of the states to the Union and of the organization of territories, their area in square miles as officially estimated, their progressive population, and their population per sq. mile according to the U. S. census returns of 1880.

The Indians, or aborigines of the country, are not included in the summary of population. These are under the protection of the general government, and are scattered over the unsettled territories or gathered upon reserves.

In 1869 the number of Indians, as located under the various superintendencies, was 289,778. Of these the Washington superintendency contained 15,808; the Oregon, 10,975; Idaho, 6468; Montana, 13,903; Dakota, 28,318; Northern (Nebraska, &c.), 6489; the Central (Kansas, &c.), 19,340; Lake Superior and Green Bay Indians, 24,047; New York, 4991; California, 21,847; Nevada, 14,000; Utah, 12,800; Wyo

ming, 2400; Colorado, 7300; Arizona, 34,500; New Mexico, 21,162; Southern Superintendency, Creeks, Cherokees, &c., 45,430.

The states on this table designated as having been admitted from 1787 to 1790 were the original 13 states which at these dates adopted the Federal constitution. A part of the original Virginia now forms the state of West Virginia. Slavery was abolished on January 1, 1863, in the insurrectionary states, except Tennessee and part of Virginia and Louisiana, by proclamation of the President, and was abolished throughout the Union by an amendment to the Constitution adopted December 18, 1865.

No other country has been peopled by so many various races. New England was settled by English Puritans; New York by Dutch; Pennsylvania by Swedes, and by English and German Friends, or Quakers; Maryland by English Roman Catholics; Delaware and New Jersey by Dutch, Swedes, and English; Virginia by English Cavaliers; the Carolinas in part by French Huguenots; Louisiana and Michigan by French; Florida, Texas, and California by Spanish; Utah by Mormons, chiefly from England, Wales, and Denmark. More recently, immigration from Germany, Ireland, England, Sweden, Scotland, Switzerland, Denmark, Norway, &c., has been large and progressive. The aggregate number of immigrants during the four years ending June 30, 1874, was 1,499,298, or an average of 374,825 per annum. The number for the fiscal year 1873—1874 was 313,339, of whom 61,999 were from England, Wales, and Scotland, 53,707 from Ireland, 97,623 from Germany, Austria, and the Netherlands, 19,178 were Scandinavians, 21,694 were of the Latin races, 5755 Slavonic, 13,776 from China, 32,960 from British North America, &c. From 1847 to 1874 the total immigration amounted to 5,927,387. Two-thirds of the entire population of the U. S. are probably of foreign extraction or the result of modern immigration.

Names of States and Territories.	Admitted.	Area in Eng. sq. miles.	Pop. in 1800.	Pop. in 1810.	Pop. in 1820.	Pop. in 1830.	Pop. in 1840.	Pop. in 1850.	Pop. in 1860.	Pop. in 1870.	Colour'd Pop. in 1870.	Pop. in 1880.	Pop. per sq. m. in 1880.
ATLANTIC STATES.													
Northern.													
Maine	1820	*31,500	151,719	228,705	298,269	399,455	501,793	583,169	628,279	626,915	1,606	648,936	20.4
New Hampshire	1788	9,280	183,762	214,460	244,022	269,328	284,574	317,976	326,073	318,300	580	346,991	37.3
Vermont	1791	10,212	154,465	217,895	235,966	280,652	291,948	314,120	315,098	330,551	924	332,286	32.5
Massachusetts	1788	7,800	423,845	472,040	523,159	610,408	737,699	994,514	1,231,066	1,457,351	13,947	1,783,085	228.
Rhode Island	1790	1,306	69,122	76,931	83,015	97,199	108,830	147,545	174,620	217,353	4,980	276,531	212.
Connecticut	1788	4,750	251,002	261,942	275,148	297,675	309,978	370,792	460,147	537,454	9,668	622,700	133.
New York	1788	47,000	589,051	959,049	1,372,111	1,918,608	2,428,921	3,097,394	3,880,735	4,382,759	52,081	5,082,871	108.
Middle.													
New Jersey	1787	†7,576	211,149	245,562	277,426	320,823	373,306	489,555	672,035	906,096	30,658	1,131,116	136.
Pennsylvania	1787	46,000	602,365	810,091	1,047,507	1,348,233	1,724,033	2,311,786	2,906,215	3,521,791	65,294	4,282,891	93.1
Delaware	1787	2,120	64,273	72,674	72,749	76,748	78,085	91,532	112,216	125,015	22,794	146,608	69.1
Maryland	1788	11,124	341,548	380,546	407,350	447,040	470,019	583,034	687,049	780,894	175,391	934,943	84.
District of Columbia	1790	60	14,093	24,023	33,039	39,834	43,712	51,687	75,080	131,700	43,404	177,624	2775.
Virginia	1788	38,352	880,200	974,600	1,065,116	1,211,405	1,239,797	1,421,661	1,596,318	1,225,163	512,841	1,512,565	39.4
Southern.													
North Carolina	1789	50,704	478,103	555,500	638,829	737,987	753,419	869,039	992,622	1,071,361	391,650	1,399,750	27.6
South Carolina	1788	34,000	345,591	415,115	502,741	581,185	594,398	668,507	703,708	705,606	415,814	995,577	29.3
Georgia	1788	58,000	162,686	252,433	340,985	516,823	691,392	906,185	1,057,286	1,184,109	545,142	1,542,180	27.
Florida	1845	59,268	. . .	. . .	. . .	34,730	54,477	87,445	140,424	187,748	91,689	269,493	4.54
GULF STATES.													
Alabama	1819	50,722	. . .	. . .	127,901	309,527	590,756	771,623	964,201	996,992	475,510	1,262,505	24.9
Mississippi	1817	47,156	8,850	40,352	75,448	136,621	375,651	606,526	791,305	827,922	444,201	1,131,597	24.
Louisiana	1812	41,346	. . .	76,556	152,923	215,739	352,411	517,762	708,002	726,915	364,210	939,946	22.7
Texas	1845	‡274,356	. . .	. . .	. . .	. . .	. . .	212,592	604,215	818,579	235,475	1,591,749	5.8
MISSISSIPPI VALLEY STATES.													
Northern.													
Michigan	1837	56,451	. . .	4,762	8,765	31,639	212,267	397,654	749,113	1,184,059	11,849	1,636,937	28.9
Wisconsin	1848	53,924	. . .	. . .	. . .	. . .	30,945	305,391	775,881	1,054,670	2,113	1,315,497	24.4
Minnesota	1857	83,531	. . .	. . .	. . .	. . .	. . .	6,077	172,023	439,706	759	780,773	9.34
Iowa	1846	55,045	. . .	. . .	. . .	. . .	43,112	192,214	674,913	1,191,792	5,762	1,624,615	29.5
Middle.													
Ohio	1802	39,964	45,365	230,760	581,295	937,903	1,519,467	1,980,329	2,339,511	2,665,260	63,213	3,198,062	80.
Indiana	1816	33,809	5,641	24,520	147,178	343,031	685,866	988,416	1,350,428	1,680,637	24,560	1,978,301	58.5
Illinois	1818	55,410	. . .	12,282	55,162	157,445	476,183	851,470	1,711,951	2,539,891	28,762	3,077,871	55.5
Missouri	1821	65,350	. . .	20,845	66,557	140,455	383,702	682,044	1,182,012	1,721,295	118,071	2,168,380	33.1
West Virginia	1862	23,000	. . .	. . .	. . .	. . .	. . .	. . .	. . .	442,014	17,980	618,457	26.9
Kentucky	1792	37,680	220,995	406,511	564,135	687,917	779,828	982,405	1,155,684	1,321,011	222,210	1,648,690	43.7
Southern.													
Tennessee	1796	45,600	105,602	261,727	422,771	681,904	829,210	1,002,717	1,109,801	1,258,520	322,331	1,542,359	35.8
Arkansas	1836	52,198	. . .	. . .	14,255	30,388	97,574	209,897	435,450	484,471	122,169	802,525	15.3
STATES AND TERRITORIES OF THE PLAINS.													
Dakota Territory	1861	150,932	. . .	. . .	. . .	. . .	. . .	. . .	4,837	14,181	94	135,177	.907
Nebraska	1867	75,995	. . .	. . .	. . .	. . .	. . .	. . .	28,841	122,993	789	452,401	5.95
Kansas	1861	81,318	. . .	. . .	. . .	. . .	. . .	. . .	107,206	364,399	17,108	996,096	12.2
Indian Territory		68,991											
ROCKY MOUNT. STATES & T.													
Northern.													
Montana Territory	1864	143,775	. . .	. . .	. . .	. . .	. . .	. . .	. . .	20,595	183	39,159	.268
Idaho Territory	1863	86,294	. . .	. . .	. . .	. . .	. . .	. . .	. . .	14,999	60	32,610	.377
Wyoming Territory	1868	97,883	. . .	. . .	. . .	. . .	. . .	. . .	. . .	9,118	183	20,789	.212
Middle.													
Colorado	1861	104,500	. . .	. . .	. . .	. . .	. . .	. . .	34,277	39,864	456	194,327	1.85
Utah Territory	1850	84,476	. . .	. . .	. . .	. . .	. . .	11,380	40,273	86,786	118	143,963	1.7
Nevada	1864	112,090	. . .	. . .	. . .	. . .	. . .	. . .	6,857	42,491	357	62,266	.598
Southern.													
New Mexico Territory	1850	121,201	. . .	. . .	. . .	. . .	. . .	61,547	93,516	91,874	172	119,565	.986
Arizona Territory	1863	113,916	. . .	. . .	. . .	. . .	. . .	. . .	. . .	9,658	26	40,440	.355
PACIFIC STATES AND T.													
Washington Territory	1853	69,994	. . .	. . .	. . .	. . .	. . .	. . .	11,594	23,955	207	75,116	1.07
Oregon	1859	95,274	. . .	. . .	. . .	. . .	. . .	13,294	52,465	90,923	346	174,768	1.83
California	1850	188,981	. . .	. . .	. . .	. . .	. . .	92,597	379,994	560,247	4,272	864,694	4.57
Alaska Territory	1867	577,390	. . .	. . .	. . .	. . .	. . .	. . .	. . .	§54,000	None.		
Aggregates		3,607,604	5,308,483	7,239,881	9,633,822	12,866,020	17,069,453	23,191,876	31,183,744	38,555,983	4,880,009	50,155,782, of whom 105,405 were Chinese.	
Coloured. Free			108,435	186,446	233,634	319,599	386,293	434,495	488,070	4,880,069			
" Slaves			893,602	1,191,362	1,538,022	2,009,043	2,487,355	3,204,313	3,953,700				

* Authority, Hydrographic Survey, 1869; Land Office Report, 1870, 35,000.

† Authority, Geological Survey, 1868; Land Office Report, 1870, 8320.

‡ Authority, Land Office Report, 1870; other authorities, 237,504. § Estimated.

NOTE.—The total number of Indians was, in 1869, officially estimated to be about 300,000. The actual number out of tribal relations in 1880 is given as 66,107.

Physical Character.—Though occupying the central portion of a continent, more than two-thirds of the frontiers of the U. S. are shores of lakes and oceans, with numerous bays and sounds, rivers and lakes. On the Atlantic coast are—Passamaquoddy, Penobscot, Casco, and Massachusetts Bays, Long Island Sound, New York, Delaware, and Chesapeake Bays, Albemarle and Pamlico Sounds, &c.; on the Gulf of Mexico—Tampa, Appalachee, Pensacola, Mobile, Atchafalaya, Galveston, Matagorda, and Corpus Christi Bays, &c.; and on the Pacific—the channel of St Barbara,

Bay of Monterey, San Francisco Bay, Humboldt Harbour, Strait of Juan de Fuca, Puget's Sound, &c., and the numberless bays and sounds of Alaska. The principal lakes, besides those divided with British America, are Champlain, Michigan, Great Salt, Pyramid, Mono, Tulare, and many beautiful clusters of smaller lakes in Maine, New York, Minnesota, &c.

The rivers of the U. S. may be classed in four divisions: 1. The Mississippi and its branches (q. v.); 2. The rivers emptying into the Atlantic or its bays and sounds—the St Croix, Penobscot, Kennebec, Merrimac, Connecticut, Hudson, Delaware, Susquehanna, Potomac, James, Roanoke, Neuse, Cape Fear, Pedee, Santee, Savannah, Altamaha, St Johns, &c.; 3. Those, besides the Mississippi, emptying into the Gulf of Mexico—the Chattahoochee, Alabama, Tombigbee, Pearl, Sabine, Trinity, Brazos, Colorado, Nueces, and Rio Grande; 4. Those emptying into the Pacific—the Oregon or Columbia, Sacramento, San Joaquin, Colorado, &c. Besides these, there are many small rivers emptying into the great lakes, and finding their outlet through the St Lawrence, and the rivers which empty into the salt lakes of the great interior basin of Utah.

The chief mountains of America are those which belong to the great eastern chain of the Alleghanies (see APPALACHIAN) and the Rocky Mountains (q. v.).—The geology of the U. S. will be found described under the titles NORTH AMERICA (*Geology*), APPALACHIAN, ROCKY MOUNTAINS, and the several states and territories.—The soil is of every variety, from the dry alkaline tracts of the territories of the plains of Nevada and Utah, which need but abundant irrigation to render them highly productive, to the inexhaustibly fertile bottom-lands of the Mississippi Valley, where heavy crops of maize have grown for fifty successive years without manuring. The St Lawrence basin is an elevated plain, moderately fertile and well wooded. The Atlantic slope from Maine to New Jersey, east of the Hudson, is hilly, and best adapted for grazing; more southerly, the coast-belt is low, sandy, in places swampy, with pine-barrens, the inland region fertile, and among the best in the country. The Mississippi Valley is generally level, and prairie-land of unsurpassed fertility, with a rich mould, in places 25 feet deep. North-west, the country rises to a high and less fertile region, extending from 200 to 400 miles from the base of the Rocky Mountains. The Texas slope has rich bottom-lands, on the coast, a fine rolling fertile country, rising to a high plateau, dry and unproductive, except in the river bottoms. The Pacific slope is sometimes sterile, except in the great valleys between the mountain-ranges and bordering the rivers, which are of great fertility. Utah, with the exception of a few fertile spots, is an untimbered region of salt lakes, and land saturated with alkaline substances. The country east of the Mississippi, except the prairies of Illinois and Indiana, was at its settlement heavily wooded, and there are still vast forests of valuable timber—beech, birch, maple, oak, pine, hemlock, spruce, walnut, hickory, ash, elm, &c.; and in the south, live oak, water oak, magnolia, palmetto, tulip-tree, cypress, cotton-wood, cane, &c. West of the 97th meridian stretches a vast and almost treeless region; forests again occur in the Rocky Mountains, and California, Oregon, and Washington Territory have the largest timber in the world. The flora and fauna will be found under the heads NORTH AMERICA (*Botany*, *Zoology*), and the several states.

Climate.—For a particular account of the climate of the U. S., we refer to the articles RAIN and TERRESTRIAL TEMPERATURE. It is remarkable for wide transitions of cold and heat, rain and drought, except in the peninsula of Florida, where the temperature varies but 12° F., and Western Oregon and Washington Territory, where the climate is like that of England. With few exceptions, the summers are hot, both north and south, the thermometer rising at times to 108° F., and along the northern range of states sinking to —20°, and even sometimes as low as —40°. The whole Atlantic coast has a winter temperature 10° lower than that of Western Europe in the same latitude. Thus, at New York, in the latitude of Madrid, the Hudson River is frozen, and the harbour at times filled with floating ice. The causes modifying the climates of the different portions of the states chiefly arise out of the physical features; of which the Rocky Mountains, the Gulf of Mexico, the Atlantic, and the lake system in the north are the most prominent. On the west, from the shores of the Pacific to the Cascade Mountains, which border the ocean at a distance of about 120 miles, the climate resembles that of Great Britain more closely than that of any other country in the world, being mild and humid, with frequent showers at all seasons. But the great valley lying between the Cascade and the Rocky Mountains receives a diminished supply of rain, because the westerly winds are partially drained of their moisture in crossing the Cascade Mountains before arriving there. In winter the mountains are covered with snow, but in summer the highlands are arid. Owing, however, to the copious streams poured down from the melting snow, it presents abundant facilities for irrigation, so that its capabilities and resources will prove great, when properly developed. In the great basin of Utah and Nevada the mountain streams are lost in sands or are evaporated, leaving extensive flats covered with alkali, and in southern Utah and Arizona the streams flow through cañons of extraordinary depth and length. The country east of the Rocky Mountains depends for its rain on the Gulf of Mexico; and the rainfall there is distributed most in the low plains, and least on the plateaux and mountains. Hence over this extensive district southerly winds are warm and moist, and westerly and northerly dry and cold. The result is rapid alternations of temperature, such as are never experienced in Western Europe, frequently ranging in the course of a day 50° or 60°. In the New England states, the northerly and easterly winds are cold, moist, and chilly, accompanied with frequent fogs; but the summer temperature is delightful. The climate of the states surrounding the great lakes in the north is mild and moist in summer as compared with the other northern states; but in winter, on the western border of the lakes, a degree of cold is experienced greater, absolutely and relatively, than anywhere else in the states; on the eastern and southern borders the temperature is moderated. This excessive cold is caused by the country being exposed in the north to the full sweep of the polar current from the north; but more particularly to its low-lying situation, thus forming as it were a vast basin into which are poured from all sides the cold and therefore heavy currents of air chilled by terrestrial radiation during the winter season.—The health of the U. S. varies with climate, elevation, &c. Swamps and river-bottoms in some regions, especially the more fertile, are malarious. The rice swamps of Georgia and South Carolina are fatal to whites, but not to negroes. In vast tracts of new country, even the rolling and hilly, the disturbance of the soil causes intermittent fevers. Diseases of the lungs prevail in the northern and eastern states, bilious fevers in the southern; in the western, intermittent and remittent bilious. In 1850, the average mortality was 1 in 72, varying rather widely in different regions, modified not only by climate, but by the presence of large towns, and by immigration and emigration. The deaths in Vermont, a rural New England state, were

1 per cent.; in Florida, the most southerly, though increased by consumptive patients from the north, 1·06; Georgia, 1·09; Alabama, 1·18; Maine and Indiana, 1·30; Ohio and Texas, 1·46; Missouri, 1·50; Massachusetts, with numerous manufacturing towns, 1·95; Louisiana, with yellow fever, and a large floating unacclimated population, 2·31. Probably no portion of the world is more salubrious than the lower Rocky Mountain regions, and the eastern slope of the Alleghanies, Florida, the northern counties of the Gulf states, the head-waters of the Mississippi, California, and Oregon.

Mineralogy.—The U. S. are rich in mineral productions. Coal is found in every state except Maine, New Hampshire, Vermont, New Jersey, Delaware, South Carolina, Mississippi, Wisconsin, Minnesota, Nevada, and Louisiana. The area of the coal-measure is estimated at 250,000 sq. miles. The whole extent of the coal area in the U. S. has been divided into four principal coal-fields or tracts—viz., the Great Central Alleghanian or Appalachian coal-field, extending from Tuscaloosa in Alabama, through Eastern Tennessee and Kentucky, West Virginia, Maryland, Ohio, Pennsylvania, and reappearing in New Brunswick and Nova Scotia. This field has been computed to cover within the United States an area of 50,000 to 60,000 sq. m., of which about 40,000 sq. m. are considered workable area. A portion of this field in Pennsylvania produces anthracite. The second coal-field occupies the greater part of Illinois and Indiana, and in extent is nearly equal to the first. A third field covers a large portion of Missouri and Iowa; and the fourth the greater part of the state of Michigan. The Chesterfield bituminous coal-field, a detached district of small area near Richmond, Virginia, contains the oldest-worked collieries in America, and for many years furnished the only supply of coal for the seaboard towns. The product of Pennsylvania alone in 1870 was 14,626,338 tons of anthracite, and 7,000,000 tons of bituminous coal. From the petroleum springs of Pennsylvania, West Virginia, and Ohio 6,170,000 bbls. flowed in 1870. See NAPHTHA. Beds of green-sand marl are found in several of the Atlantic states, and in many, nitrates and carbonates of sodium and potassium, also gypsum, and marble of great variety and some of rare beauty. Iron is found everywhere, from the richest ores in mountain masses, to bog-ore; and in many places in close proximity to coal. Lead exists in rich deposits in Missouri, Arkansas, Illinois, and Iowa. Copper is found in several states, and in great quantities in ores of 71 to 90 per cent. on the borders of Lake Superior. Zinc exists in considerable quantities in Wisconsin, New Jersey, and Pennsylvania. Tin has been found in Maine and California. Silver is found in lead and copper, and in rich silver mines in New Mexico, Arizona, Nevada, California, and Utah. Gold is found in small quantities in the eastern states, in larger deposits in Virginia, North and South Carolina, and Georgia, and in great quantities in California, Oregon, Nevada, Colorado, Washington, Arizona, New Mexico, Idaho, and Montana. There are also found platina in small and mercury in large quantities in California, osmium and iridium in Oregon, cobalt in North Carolina and Missouri, and nickel in Connecticut and Pennsylvania.

Agriculture.—With an abundance of fertile land, agriculture holds the first place in the national industry. In 1870, 407,735,041 acres were occupied as farms, of which the cultivated land was 188,921,099 acres. According to the latest returns, the acreage of the principal crops is as follows: hay, 10,009,052; Indian corn, 34,091,137; wheat, 19,943,893; oats, 8,365,800; rye, 1,069,531; Irish potatoes, 1,200,912; buckwheat, 413,015; tobacco, 356,762; barley, 1,177,666. The other principal crops are sugar, rice, peas and beans, hemp, flax, &c., and the number of acres so improved is about as follows: rice, 175,000; hemp, 110,000; flax, 100,000; orchards, 500,000; gardens, 500,000; vineyards, 250,000; miscellaneous, 1,000,000. The average size of farms, nearly all held by their cultivators in fee-simple, is about 200 acres; in New England, about 100 acres; in the Southern States, 320 acres. The quantities of the chief agricultural productions in 1870 were—Indian corn, 760,944,549 bushels; wheat, 287,745,626; rye, 16,918,795; barley, 29,761,305; oats, 282,107,157; buckwheat, 9,821,721; potatoes (Irish), 143,337,443; (sweet), 21,709,824; hay, 27,316,048 tons; tobacco, 263,735,341 lbs.; cotton, 3,011,996 bales, the total estimated value of the farm productions being $2,447,538,658. In the years 1869—1870, 2,159,516 acres of the public land were sold for cash, mostly at the ordinary price of $1.25 an acre; 515,360 acres were bought with military warrants, and 3,698,910 acres were entered under the law of Congress which gives a homestead after five years' occupation; 192,848 were given to agricultural schools, 996,685 to railways, and 500,000 acres to the states in which they lie or for Indian reservations. Vast quantities of land have been impoverished and abandoned, but improved systems of agriculture, fostered by the government, for increasing scientific knowledge, have been widely introduced.

Wheat and maize are grown in all the states; cotton south of lat. 37°; cane-sugar in Louisiana, Texas, and Florida; hemp and tobacco, chiefly between lat. 34° and 40°; rice in South Carolina and Georgia; figs and oranges flourish in the Gulf States; and peaches, grapes, melons, and other delicious fruits are abundant and in great perfection in favoured districts south of lat. 43°.

Manufactures, Commerce, &c.—Manufactures, protected by high duties on foreign importations, have had a rapid development, as will be seen in the accounts of individual states. The census of 1870 gave the following aggregates for the year: pig iron, 2,052,821 tons; rolled iron, 1,500,000 tons; manufactories of cotton, 956, making goods to the value of $177,489,739; nearly 3000 woollen mills, using 154,767,095 lbs. of wool and 17,571,929 lbs. of cotton in mixed fabrics; leather in boots and shoes, harness, &c., value $54,191,167; flouring and gristmill products, $444,985,145; lumber sawed, $210,159,327; with large quantities of petroleum, spirits, India-rubber goods, paper, oil-cloth, carriages, agricultural instruments. The chief manufacturing states are Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Maryland. The whole number of manufacturing establishments, large and small, in the U. S., in 1870, was 252,148, employing a capital of $2,118,208,769; using raw material of the value of $2,488,427,242; and employing the labour of 1,615,598 males and 323,770 females, at a cost of $775,584,343, and producing manufactures valued at $4,232,325,442.

The foreign commerce of the U. S. in the official year ending June 30, 1874, amounted in gold value to $1,248,774,693, exports to $652,913,445, and imports to $595,861,248. The chief exports were cotton (unmanufactured), valued at $211,223,580; bread and breadstuffs, $161,198,864; gold and silver, $59,808,736; illuminating oil, $37,560,945; tobacco, $32,968,528; provisions, fish, &c., $77,649,523. The chief imports, sugar and molasses, $92,849,203; wool and woollen goods, $55,133,494; iron and steel and their manufactures, $33,793,546; coffee, $55,048,967; cotton goods, $28,193,869; silk goods, &c., $23,996,782; hides and skins, $16,444,877; tea, $21,112,234; tin, $16,245,471. Tonnage, June 1, 1874, 4,595,883, of which 1,116,425 tons were

steamboats.—Great facilities for internal commerce are given by free trade between all states and territories, and the great extent of navigable rivers, canals, and railways. The Mississippi and its branches afford 20,000 miles of steamboat navigation; and most of the rivers emptying into the Atlantic, Gulf of Mexico, and Pacific, are navigable from 100 to 500 miles; canals unite the waters of the Hudson river with Lakes Champlain, Ontario, and Erie in New York, the Delaware and Susquehanna rivers in Pennsylvania, the Ohio with Lake Erie in Ohio and Indiana, and the Mississippi with Lake Michigan in Illinois. Other canals make with these an extent of 3188 miles, costing $100,000,000. Railways extend from the lakes to the Gulf of Mexico, and from the Atlantic to the Pacific, of which there were, in 1874, 71,021 miles opened and 10,000 miles projected. There are also 85,583 miles of electric telegraph.

Education and Religion.—The benevolent, literary, and scientific institutions of the U. S. are generally state institutions or private, accounts of which will be found under the heads of the respective states. The exceptions are the Smithsonian Institution (q. v.), American Association for the Advancement of Science, and the National Academy of Sciences, and military and naval academies and hospitals.—In the U. S. are 360 colleges and collegiate institutions, 93 theological schools, 20 schools of law, 71 of medicine, 26 scientific, great numbers of academies or high schools, and female seminaries. Free common schools are established in nearly all the states, sufficient for universal education, supported by taxes and school-funds, and in all the new states, the reservation of one or two sections of land, of 640 acres each, in every township. There are 6 public libraries of over 100,000 volumes, 8 over 50,000, 16 over 30,000, and a great many lyceums, literary societies, and courses of popular lectures. In 1871 there were 6056 periodical publications issued in the U. S., 382 in Canada and the British colonies, a total of 6438; of which, 637 are daily; 118 tri-weekly; 129 semi-weekly; 4642 weekly; 21 bi-weekly; 829 monthly, semi-monthly, or bimonthly, &c.; and 62 quarterly. The total annual circulation of periodicals in the U. S. amounts to 1,436,551,538 or 38 copies for each inhabitant. The number of periodicals has been doubled within six years.

Religion is free from any interference of either the Federal or state governments, and all denominations exist in entire freedom upon the voluntary principle. There were, in 1870, 72,459 churches or places of worship, giving 560 seats to each 1000 of population. In 1860 the adherents of the Catholic Church were estimated at 3 millions, the Protestants at 25 millions. Of the 20 or more denominations of Protestants, the most numerous were the Methodists (1,650,217); after whom came Baptists (1,231,877), Presbyterians (654,240), Universalists (600,000), Disciples (Campbellites) (350,000), Congregationalists (289,110), Lutherans (260,135), Christian Connection (180,000), Episcopalians (150,593), United Brethren in Christ (102,583), German Reformed (100,691), Friends (94,000). There are 200,000 Jews, 60,000 Mormons, and many smaller sects.

Constitution, Government, &c.—The government of the United States is one of limited and specific power; strictly defined by a written constitution, framed by a convention of the states in 1787, which went into operation after being ratified by the thirteen original states in 1789, by which instrument the several states, having their independent republican governments, conferred upon a Federal Congress, executive, or President, and judiciary, such powers as were necessary to 'form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defence, and secure the blessings of liberty.' The legislative powers granted to the Federal government are vested in a Congress of the United States, consisting of a Senate of two senators from each state, chosen by the legislature thereof; and a House of Representatives, consisting of one or more members from each state, elected by the people in equal electoral districts; so that the states, large and small, have each 2 votes in the Senate, and from 1 to 32 in the House of Representatives, which, in 1870, contained 243 members, but has been increased to 292, or 1 for every 133,000 of the population. The senator must be at least 30 years old, and is chosen for 6 years; the representative, at least 25 years old, and is elected for 2 years. Senators and representatives are paid $5000 per annum, and mileage at 20 cents a mile. The Senate is presided over by the Vice-president; and is a high court for trial of cases of impeachment. It also confirms the appointments of the President, and ratifies treaties made with foreign powers. Revenue bills originate in the House of Representatives. Bills passed by both Houses, within the limits of their constitutional powers, become laws, on receiving the sanction of the President; or, if returned with his veto, may be passed over it by two-thirds of both Houses.

By the constitution, the states granted to Congress power 'to lay and collect taxes, duties, imports, and excises, to pay the debts, and provide for the common defence and general welfare of the United States;' to borrow money; to regulate commerce; to establish uniform naturalisation and bankruptcy laws; to coin money, and fix the standards of weights and measures, and punish counterfeiting; to establish post-offices and post-roads; to secure patents and copyrights; punish piracies; declare war; raise armies and a navy; to call out the militia, reserving to the states to appoint their officers; and to govern the district of Columbia, and all places purchased for forts, arsenals &c., with the consent of the state legislatures. All powers not expressly granted are reserved to the states or the people; but the states, though sovereign and independent under the constitution, with all powers of local legislation, eminent domain (i. e., absolute possession of the soil), and power of life and death, with which neither President nor Congress can interfere, cannot make treaties, coin money, levy duties on imports, or exercise the powers granted to Congress.

The executive of the Federal government is a President, chosen by an electoral college, equal in number to the senators and representatives, elected by the people of the states. He must be a native of the United States, at least 35 years old, and is elected for a term of four years, and may be re-elected without limit. His salary is $50,000 a year. The Vice-president, who, in case of the death of the President, succeeds him, is President of the Senate. If he should die after becoming President, a new election by the people would be held. The President, by and with the consent of the Senate, appoints a cabinet, consisting of the Secretaries of State and Foreign Affairs, Treasury, War, Navy, Interior, the Postmaster-general, and Attorney-general. These officers have salaries of $8000 a year, have no seats in Congress, and are solely responsible to the President, who also appoints directly or through his subordinates, the officers of the army and navy—of which he is commander-in-chief—the justices of the Federal judiciary, revenue-officers, postmasters, &c.—in all about 100,000 persons.

The judiciary consists of a supreme court, with one chief-justice and seven associate justices, appointed by the President for life, and district judges in each district. The supreme court has jurisdiction in all cases arising under the constitution, laws, and treaties of the United States; causes affecting ambassadors and consuls, of admiralty and jurisdiction; controversies to which the United States is a party, or between a

state and the citizens of another state, citizens of different states, citizens and foreign states. It has original jurisdiction in state cases, or those affecting ambassadors or consuls—in others appellate. A person may be tried for treason, both against the Federal government and against the state of which he is a citizen. The President can reprieve or pardon a person condemned by a Federal court; but has no power to interfere with the judgment of state tribunals. Besides the supreme court, there are United States district courts, with judges, district attorneys, and marshals, in districts comprising part or whole of the several states. The citizens of each state are entitled to all privileges and immunities of the several states. Criminals escaping from one state to another are given up for trial on demand of the executive; and the constitution declares that 'no person held to service or labour in one state, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labour, but shall be delivered up on claim of the party to whom such service or labour may be due.' The constitution may be amended by a convention called at the request of two-thirds of the states; or amendments may be proposed by a vote of two-thirds of Congress, and ratified by two-thirds of the states; but 'no state, without its consent, shall be deprived of its equal suffrage in the Senate.'

The President, either directly, or through the Secretary of State and Foreign Affairs, appoints ministers, consuls, and consular agents to foreign countries. There are 13 envoys-extraordinary and ministers-plenipotentiary, receiving from $17,500 to $10,000 salary; 18 ministers resident, $10,000 to $4000. The consuls are paid by fees or salaries from $500 to $7500 per annum.

Revenue, Expenditure.—The following table will give a fair exhibit of the expenditures and debt of the United States during the last 25 years:

Year.	Civil List.	Military.	Naval.	Total Expenses.	Principal of Debt.
	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.
1848	5,585,070	27,820,163	9,406,737	42,811,970	65,804,450
1850	14,839,725	12,801,764	7,923,313	43,002,168	64,228,238
1852	17,379,768	13,424,075	8,928,236	46,007,896	67,560,395
1854	25,907,372	14,342,684	10,768,192	51,018,248	44,975,456
1856	25,274,331	20,821,024	14,077,047	60,172,402	30,963,910
1858	26,387,822	31,537,307	13,976,001	71,901,130	44,910,778
1860	31,925,557	16,409,767	11,513,150	59,848,474	64,769,703
1862	24,511,476	394,368,707	42,674,569	461,554,752	511,826,274
1864	35,033,498	690,791,842	85,733,292	811,558,632	1,740,690,489
1865	735,125,497	1,030,690,400	122,617,434	1,906,433,331	2,680,647,869
1866	812,903,743	283,154,676	43,285,662	1,139,344,081	2,773,236,173
1868	920,877,820	123,246,648	25,775,502	1,069,899,970	2,611,687,851
1870	79,435,904	57,655,675	21,780,229	702,907,842	2,480,672,428
1872	96,579,889	35,372,157	21,249,810	153,201,856	2,253,251,328
1874	105,372,471	42,313,927	30,932,587	178,618,985	2,251,690,468

In 1860 the revenue from customs amounted to $53,187,512; lands, $1,778,557; other sources, $1,078,522,—total, $56,064,607. In 1874 the revenue from customs was $163,103,833; internal revenue, $102,409,784; lands, $1,852,428; premiums on sales of coin, $5,037,665; other sources, including direct tax, $49,782,521,—total revenue, $322,186,231. The expenditures for 1874 were, Indians, $6,692,462; pensions, $29,058,414; miscellaneous, $50,506,414; premiums on bonds purchased, $1,395,273; interest, $107,119,815. The following are some of the principal items of revenue for the years ending June 30, 1873 and 1874:

	1873.	1874.	Decrease.
Spirits	52,099,371	49,444,089	2,655,281
Tobacco	34,386,303	33,242,875	1,143,427
Fermented liquors	9,324,937	9,304,679	20,258
Banks and bankers	3,771,031	3,387,187	383,870
Penalties	461,653	364,216	97,436
Stamps	7,702,376	6,136,844	1,565,532
Back Taxes	6,329,782	764,880	5,564,901

The currency of the United States is a mixed one. A specie currency was for many years the only money recognised by the Federal government, but the exigences of the war of 1861—1865 compelled the government to issue large amounts of paper-money and to establish a system of national banks, now (1875) 2021 in number, issuing government paper, and having a circulation (Nov. 1, 1874) of $348,791,152. Of these banks 511, with a capital of $162,596,482 and a circulation of $109,705,018, are located in the Eastern States; 585, capital, $191,471,669, circulation, $123,052,872, in the Middle States; 215, capital, $46,392,500, circulation, $36,895,704, in the Southern and South-western States; 684, capital, $95,439,150, circulation, $77,174,850, in the Western States; and 26, capital, $2,475,325, circulation, $1,962,708, in the Pacific States and Territories. Also 7 gold banks are in operation in California, with a capital of $3,650,000, and a circulation of $2,150,000.

The specie currency of the United States consists of the gold dollar; the half-eagle, $5; the eagle, $10, the double eagle, $20; silver dollar, half-dollar, quarter; dime, 10 cents; half-dime; and nickel cent, or 100th part of a dollar. The official estimate of the amount of specie in the country June 30, 1874, was $166,846,228.49. The coinage for the year ending at that date was, gold, $50,442,690; silver, $5,983,601.30; minor coinage, $411,925—total $56,838,216.30.

Army and Navy.—The army of the United States, under the command of the President, consisted, in 1790, of 1260 men. In 1861, its numbers were 14,000, and those who took part with the Confederates, or were disbanded in the rebellious states, reduced the number to about 5000. April 15, 1861, 75,000 volunteers were called out; May 4, 64,000; July and December, 1861, 500,000; July 1, 1862, 300,000; August 4, 1862, 300,000; summer of 1863, 300,000; February 1, 1864, 500,000,—total, 2,039,748. On March 1, 1865, the aggregate was 965,591 men, which was augmented by enlistments, on May 1, to 1,000,576 of all arms, when orders for the disbandment were issued. On August 7, 640,806, and on November 15, 800,963 had been mustered out of service. This vast army was procured by volunteering, by enlistment in the regular army, and by drafts or conscriptions; but the greater part by bounties of $300 to $1000 to each volunteer. The regular army of the United States was reduced to the legal standard of 30,000 enlisted men on the 1st of July, 1871. The militia of the United States, organised under the state governments, numbers 3,245,193. There are numerous arsenals and manufactories of arms,—at Springfield (q. v.), Mass.; Pittsburg (q. v.), Penn., &c. The Military Academy at West Point, N. Y., educates cadets nominated from each state by members of Congress, and appointed by the President, who receive commissions as officers in the army. A Naval Academy has been established at Annapolis, Md., for the education of naval cadets.

For numbers and character of the United States navy, see NAVY, U. S., and MONITOR.

The Post-office Department, organised before the Revolution of 1775 by Benj. Franklin, had in the year ending June 30, 1870, 28,492 offices; 8861 routes, extending 231,232 m., including 43,727 m. of railway; its expenses were $23,998,837, and its revenue $19,772,220.

The Secretary of the Interior has charge of the survey and sale of the public lands of the United States, the Patent Office, Indian Office, Pension Office, Public Buildings, National Hospital for the Insane, Institution for Deaf and Dumb, Public Printing, and Education.

History.—The territories now occupied by the United States of America, though they were probably visited on their north-eastern coast by Norse navigators about the year 1000, continued the sole possession of numerous tribes of Indians (who had succeeded earlier and extinct races), until the discovery of

America by Columbus, 1492. In 1498, an English expedition, under the command of Sebastian Cabot, explored the eastern coast of America from Labrador to Virginia, perhaps to Florida. In 1513, Juan Ponce de Leon landed near St Augustine in Florida, and explored a portion of that region in a romantic search for the Fountain of Youth. In 1520, some Spanish vessels from St Domingo were driven upon the coast of Carolina. In 1521, by the conquests of Cortes and his followers, Mexico, including Texas, New Mexico, and California, became a province of Spain. In 1539—1542, Ferdinand de Soto led a Spanish expedition from the coast of Florida across Alabama, and discovered the Mississippi River. In 1584—1585, Sir Walter Raleigh sent two expeditions to the coast of North Carolina, and attempted to form settlements on Roanoke Island. A Spanish settlement was made at St Augustine, Florida, 1565. Jamestown, Virginia, was settled in 1607; New York, then called the New Netherlands, 1613; Plymouth, Massachusetts, 1620. A large part of the country on the great lakes and on the Mississippi was explored by La Salle in 1682; and settlements were made by the French at Kaskaskia and Arkansas Post, 1685; Mobile and Vincennes, 1702. The early history of the various colonies which now constitute the U. S. will be found under the heads of the different states and territories. The first effort at a union of colonies was in 1643, when the settlements in Massachusetts, New Hampshire, Rhode Island, and Connecticut formed a confederacy for mutual defence against the French, Dutch, and Indians, under the title of 'The United Colonies of New England.' They experienced the benefits of united action in 1754, when an English grant of lands to the Ohio Company brought on the French and Indian war—the French claiming, at that period, as the first explorers, Northern New England, half of New York, and the entire Mississippi Valley. George Washington was sent on his first expedition, to remonstrate with the French authorities; and the colonies being advised to unite for general defence, a plan for a general government of all the English colonies was drawn up by Benjamin Franklin; but it was rejected by both the colonies and the crown —by the colonies, who wished to preserve their separate independence, and by the crown from a jealousy of their united strength. The colonists, however, took an active part in the war. Under Major Washington, they joined General Braddock in his unfortunate expedition against Fort Du Quesne, now Pittsburg; they aided in the reduction of Louisburg, Ticonderoga, Crown Point, and Niagara; and rejoiced in the conquest of Quebec, by which the vast northern regions of America became the possessions of Great Britain.

The principles of a democratic or representative government were brought to America by the earliest colonists. The colonies themselves were founded by private adventure, with very little aid from government. The Plymouth colony was for 18 years a strict democracy, and afterwards a republic under a charter from the crown. A representative and popular government was established in Virginia in 1620. It was not until the Protectorate and the reign of Charles II. that the colonies were considered as portions of the empire, to be governed by parliament, when navigation acts were passed to give English ships a monopoly of commerce, when the produce of the colonies was required to be sent to England, and duties were levied on commodities sent from one colony to another. Protests were made against these assumptions; Virginia asserted her right of self-government; and it was not until the English revolution of 1688 that settled and uniform relations with the different colonies were established.

In 1713, by the treaty of Utrecht, England, which, since the reign of Elizabeth, had imported slaves from Africa into her American and West Indian colonies, obtained a monopoly of the slave-trade, engaging to furnish Spanish America, in 33 years, with 144,000 negroes. A great slave-trading company was formed in England, one quarter of the stock being taken by Queen Anne, and one-quarter by the king of Spain, these two sovereigns becoming the greatest slave-dealers in Christendom. By this monopoly, slavery was extended in, and to some extent forced upon, all the American colonies.

At this period, there was a general feeling of loyalty towards the mother country. The sons of the more wealthy colonists, especially in the south, were educated in England; English literature pervaded the colonies; the British throne was the fountain of honour; the colonies, though distinct, and differing in origin and character—Puritan in the East, Dutch Reformed in New York, Quaker in Pennsylvania, Catholic in Maryland, and Church of England in Virginia—were yet united by language, common ties, fears, and interests. In 1761, the enforcement of the Navigation Act against illegal traders, by general search-warrants, caused a strong excitement against the government, especially in Boston. The British Admiralty enforced the law; many vessels were seized; and the colonial trade with the West Indies was annihilated. In 1765, the passing of an act of parliament for collecting a colonial revenue by stamps caused general indignation, and led to riots. Patrick Henry, in the Virginia Assembly, denied the right of parliament to tax America, and eloquently asserted the dogma, 'no taxation without representation.' The first impulse was to unite against a common danger; and the first colonial congress of 28 delegates, representing 9 colonies, made a statement of grievances and a declaration of rights. The stamps were destroyed or reshipped to England, and popular societies were formed in the chief towns, called 'Sons of Liberty.' In 1766, the Stamp Act was repealed, to the general joy of the colonists; but the principle of colonial taxation was not abandoned; and in 1767, duties were levied on glass, paper, printers' colours, and tea. This renewed attempt produced, in 1768, riots in Boston, and Governor Gage was furnished with a military force of 700 to preserve order and enforce the laws. In 1773, the duties were repealed, excepting 3*d*. a pound on tea. It was now a question of principle, and from north to south it was determined that this tax should not be paid. Some cargoes were stored in damp warehouses and spoiled; some sent back; in Boston, a mob, disguised as Indians, threw it into the harbour. To punish this measure, parliament passed the Boston Port Bill, 1774, by which the chief town of New England was no longer a port of entry, and its trade transferred to Salem. The people were reduced to great distress, but received the sympathy of all the colonies, and liberal contributions of wheat from Virginia, and rice from Charleston, South Carolina.

It was now determined to enforce the government of the crown and parliament over the colonies; and a fleet, containing several ships of the line, and 10,000 troops, was sent to America; while the colonists, still asserting their loyalty, and with little or no thought of separation from the mother country, prepared to resist what they considered the unconstitutional assumptions of the government. Volunteers were drilling in every direction, and dépôts of provisions and military stores were being gathered. A small force being sent from Boston to seize one of these dépôts at Concord, Massachusetts, led to what is called the battle of Lexington, and

the beginning of the war of the Revolution, April 19, 1775. The British troops were attacked on their return by the provincials, and compelled to a hasty retreat. The news of this event summoned 20,000 men to the vicinity of Boston. The royal forts and arsenals of the colonies were taken possession of, with their arms and munitions. Crown Point and Ticonderoga, the principal northern fortifications, were surprised, and their artillery and stores appropriated. A Congress of the colonies assembled at Philadelphia, which resolved to raise and equip an army of 20,000 men, and appointed George Washington commander-in-chief. June 17, Bunker Hill, in Charleston, near Boston, where 1500 Americans had hastily intrenched themselves, was taken by assault by the British troops, but with so heavy a loss (1054) that the defeat had for the provincials the moral effect of a victory. After a winter of great privations, the British were compelled to evacuate Boston, carrying away in their fleet to Halifax 1500 loyal families.

The British government now put forth a strong effort to reduce the colonies to submission. An army of 55,000, including 17,000 German mercenaries ('Hessians'), was sent, under the command of Sir William Howe, to put down this 'wicked rebellion.' The provincial Congress, declaring that the royal authority had ceased, recommended to the several colonies to adopt 'such governments as might best conduce to the safety and happiness of the people;' and the thirteen colonies soon adopted constitutions as independent and sovereign states. On the 7th of June 1776, Richard Henry Lee, of Virginia, offered a resolution in Congress, declaring that 'the united colonies are, and ought to be, free and independent states; that they are absolved from all allegiance to the British crown; and that all political connection between them and the state of Great Britain is, and ought to be, totally dissolved.' This resolution, after an earnest debate, was adopted by the votes of 9 out of 13 colonies. A committee, consisting of Thomas Jefferson, John Adams, Benjamin Franklin, Roger Sherman, and Robert R. Livingston, was instructed to prepare a declaration in accordance with the above resolution; and the celebrated Declaration of Independence, written by Mr Jefferson, based upon the equality of men and the universal right of self-government, and asserting that 'all government derives its just powers from the consent of the governed,' on the 4th of July 1776, received the assent of the delegates of the colonies, which thus dissolved their allegiance to the British crown, and declared themselves free and independent states, under the general title of the thirteen United States of America—New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia—occupying a narrow line of the Atlantic coast between Canada and Florida, east of the Alleghanies, with a population of about 2,500,000.

After the evacuation of Boston, General Washington, with the remains of his army, thinned by the hardships of winter, hastened to New York. On the 2d of July, General Howe, being joined by his brother, Admiral Lord Howe, and Sir Henry Clinton, found himself at the head of 35,000 men; defeated the Americans on Long Island, August 27, 1776, compelled the evacuation of New York, and secured the possession of its spacious harbour, and the river Hudson. General Washington, with inferior and undisciplined forces, retreated across New Jersey, closely followed by the English, hoping to save Philadelphia. Newark, New Brunswick, Princeton, the chief towns in New Jersey, were taken, and the British awaited the freezing of the Delaware to occupy Philadelphia. On Christmas night, General Washington, by crossing in boats among floating ice, made a successful attack upon a Hessian force at Trenton, and a few days later at Princeton, and gave new courage to the desponding Americans, who recruited the army, and harassed the enemy with a winter campaign.

In the meantime, Silas Deane and Benjamin Franklin had been sent to France to solicit recognition and aid. The recognition was delayed, but important aid was privately given in money and supplies, and European volunteers—the Marquis de Lafayette, Baron Steuben, Baron de Kalb, Kosciusko, and Pulaski, rendering the most important services. Efforts were made to induce the British colonies of Canada and Nova Scotia to unite in the struggle for independence, and an expedition was sent against Montreal and Quebec, led by Generals Montgomery and Arnold. The Canadians refused their aid; Montgomery was killed, Arnold wounded, and the remains of the expedition returned after terrible sufferings. In 1777, after several severe actions in New Jersey, generally disastrous to the Americans, the British took possession of Philadelphia; and Washington, with the remnants of his army, went into winter-quarters at Valley Forge, where they suffered from cold, hunger, and nakedness.

While Washington was unsuccessfully contending against disciplined and overwhelming forces in New Jersey, General Burgoyne was leading an army of 7000 British and German troops, with a large force of Canadians and Indians, from Canada into Northern New York, to form a junction with the British on the Hudson, and separate New England from the rest of the rebel confederacy. His march was delayed by felled trees and destroyed roads; his foraging expeditions were defeated; and after two sharp actions at Stillwater and Saratoga, with but three days' rations left, he was compelled to capitulate, October 17; and England, in the midst of victories, heard with dismay of the loss of an entire army. The Americans gained 5000 muskets, and a large train of artillery. Feeling the need of more unity of action, articles of confederation, proposed by Franklin in 1775, were adopted in 1777, which constituted a league of friendship between the states, but not a government which had any powers of coercion.

In 1778, Lord Carlisle was sent to America by the British government with offers of conciliation, it was too late. France at the same time recognised American independence, and sent a large fleet and supplies of clothing, arms, and munitions of war to their aid; and General Clinton, who had superseded General Howe, finding his supplies at Philadelphia threatened, retreated to New York, having been defeated by the Americans at Monmouth.

The occasional successes of the British armies, the aid afforded by great numbers of Americans who still adhered to the royal cause and furnished during the war not less than 20,000 troops, and the alliance of large tribes of Indians, who committed cruel ravages in the frontier settlements, did little towards subjugating the country. Portions of the sea-coast of New England and Virginia were laid waste; but the king's troops were worn out with long marches and tedious campaigns, and even weakened by victories. Spain, and then Holland, joined in the war against England, and aided the Americans. Paul Jones, with ships fitted out in French harbours, fought desperate battles under the American flag on the English coast. But the king and parliament obstinately persisted in the vain attempt to preserve the integrity of the empire.

In 1780, 85,000 seamen were raised, and 35,000 additional troops sent to America, and a strong effort was made to subjugate the Carolinas, where the war became of a bitter partisan character, and was conducted with spirit by Sumpter, Marion, and other Southern chieftains. Lord Cornwallis, with a large army, marched from Charleston, through North Carolina, pursuing, and sometimes defeating, the American General Gates, but suffered defeat at King's Mountain, in North Carolina, at Cowpens, in South Carolina, and at Eutaw Springs, which nearly closed the war in the South. In the mean time, Admiral de Varney had arrived upon the coast with a powerful French fleet, and 6000 soldiers of the élite of the French army, under Count de Rochambeau. Cornwallis was obliged to fortify himself at Yorktown, blockaded by the fleet of Count de Grasse, and besieged by the allied army of French and Americans, waiting for Sir Henry Clinton to send him relief from New York. October 19, 1781, he was compelled to surrender his army of 7000 men—an event which produced such a change of feeling in England as to cause the resignation of the ministry, and the despatch of General Sir Guy Carleton to New York with offers of terms of peace. The preliminaries were signed at Paris, November 30, 1782; and on September 3, 1783, peace was concluded between England and France, Holland, and America. The independence of each of the several states was acknowledged, with a liberal settlement of territorial boundaries. In April, a cessation of hostilities had been proclaimed, and the American army disbanded; New York, which had been held by the English through the whole war, was evacuated November 25; and on December 4, General Washington took leave of his companions in arms, and on December 23 resigned into the hands of Congress his commission as commander.

From the retreat of Lexington, April 19, 1775, to the surrender of Yorktown, October 19, 1781, in 24 engagements, including the surrender of two armies, the British losses in the field were not less than 25,000 men, while those of the Americans were about 8000.

The states were free, but exhausted, with a foreign debt of $8,000,000, a domestic debt of $30,000,000, an army unpaid and discontented, a paper-currency utterly worthless, and a bankrupt treasury. The states were called upon to pay their shares of the necessary expenditures, but they were also in debt, and there was no power to compel them to pay, or to raise money by taxation. In these difficulties, and the failure of the articles of confederation, a convention was summoned by Congress in 1787, to revise these articles. The task was so difficult, that the Convention resolved to propose an entirely new constitution, granting fuller powers to a Federal Congress and executive, and one which should act upon the people individually as well as upon the states. The constitution was therefore framed, whose provisions have already been stated, and which is still the basis of the government; and though strongly opposed by many, who believed that the extensive powers granted by it to Congress and the executive would be dangerous to the liberties of the people, it was, in 1787—1788, adopted, in some cases by small majorities, in 11 state conventions, and finally by the whole 13 states, chiefly through the exertions and writings of James Madison, John Jay, and Alexander Hamilton. Virginia ratified the constitution with the declaration, that she was at liberty to withdraw from the union whenever its powers were used for oppression; and New York, after Hamilton had declared that no state could ever be coerced by an armed force. The country was at this period divided into two parties: the Federalists, who were in favour of a strong centralised government, and the Anti-federalists, who held to the sovereignty and rights of the independent states. George Washington and John Adams, standing at the head of the Federalist party, were elected President and Vice-president of the United States. The President took the oath to support the constitution in front of the City Hall in New York; and the government was organised with Thomas Jefferson, Secretary of State; Alexander Hamilton, Secretary of the Treasury; General Knox, Secretary of War; and John Jay, Chief Justice of the supreme court. Congress assumed the war-debts of the several states, and chartered the bank of the United States, though its constitutional right to do so was strenuously denied by the Republican or States' Rights party. Washington was re-elected to the presidency in 1792; but party-spirit increased, excited by the events of the French Revolution. Citizen Genet, who represented the French Republic in America, fitted out privateers against England, and his recall was demanded by the President. The Federalists took the side of England in the great European contest, while the Republicans sympathised with the Revolution. There grew up also difficulties between the English and American governments. The Americans accused the English of carrying off large numbers of negroes and other property at the close of the war; while the English accused the Americans of sequestrating the property of loyalists, which they had engaged by treaty to restore to them. These controversies were happily settled by Mr Jay.

In 1796, Washington, worn and irritated by partisan conflicts and criticisms, refused a third election, and issued his farewell address to the people of the U. S., warning them against the dangers of party-spirit and disunion, and giving them advice worthy of one who was said to be 'first in war, first in peace, and first in the hearts of his countrymen.' John Adams was elected President; and Thomas Jefferson, the second choice of the people for the presidency, became, according to the rule at first adopted, Vice-president. In 1798, the commercial regulations of France, and the assertion of the right to search and capture American vessels, nearly led to a war between the two republics. In 1799, the nation, without distinction of party, mourned the death of Washington; and, in the following year, the seat of government was removed to the city he had planned for a capital, and which bears his name. The partiality of Mr Adams for England, the establishment of a Federal army, and the passage of the Alien and Sedition Laws, by which foreigners could be summarily banished, and abuse of the government, by speech or the press, punished, caused great political excitement, and such an increase of the Republican, or, as it was afterwards called, the Democratic party, that the President failed of a re-election in 1801; and there being no election by the people, the House of Representatives, after thirty-six ballotings, chose Thomas Jefferson, the Republican candidate, with Aaron Burr for Vice-president; and the offices of the country were transferred to the victorious party. Internal duties, which a few years before had led to an insurrection in Pennsylvania called the Whisky Insurrection, were abolished, and the Alien and Sedition Laws repealed. Tennessee, Kentucky, Vermont, and Ohio had now been organized as states, and admitted into the Union. In 1803, the area of the country was more than doubled by the purchase of Louisiana—the whole region between the Mississippi and Rocky Mountains—from France for 60,000,000 francs. The infant navy waged a successful

war with Tripoli. In 1805, Mr Jefferson was elected for a second term; but Mr Burr, having lost the confidence of his party, engaged in a conspiracy to seize upon the Mississippi Valley, and found a new empire, with its capital at New Orleans. He was tried for treason, but not convicted. The commerce of America was highly prosperous, her ships enjoying much of the carrying-trade of Europe; but, in May 1806, England declared a blockade from Brest to the Elbe, and Bonaparte, in November, decreed the blockade of the coasts of the United Kingdom. American vessels were captured by both parties, and were searched by British ships for British subjects; and those suspected of having been born on British soil, were, in accordance with the doctrine, once a subject always a subject, impressed into the naval service. Even American men-of-war were not excepted from this process. The British frigate *Leopard* meeting the American frigate *Chesapeake*, demanded four of her men, and on refusal, fired into her, and the surprised *Chesapeake* struck her flag. British ships were hereupon forbidden U. S. harbours.

Mr Jefferson, following the example of Washington, declined a third election; and, in 1809, James Madison became President. The French decrees, prejudicial to neutral commerce, were revoked in 1810; but the English continued, a source of loss and irritation, while hundreds of American citizens were in forced service in British vessels. The feeling was increased by a night-encounter between the American frigate *President* and the British sloop-of-war *Little Belt*, May 16, 1811. In April 1812, an embargo was again declared by Congress, preparatory to a declaration of war against Great Britain, July 19, for which Congress voted to raise 25,000 enlisted soldiers, 50,000 volunteers, and 100,000 militia. General Hull, with 2000 men at Detroit, invaded Canada; but on being met by a small force of British and Indians, under General Brock, recrossed the river, and made a shameful surrender; and was sentenced to death for his cowardice, but pardoned by the President. A second invasion of Canada was made near Niagara Falls by General Van Rensselaer. One thousand American militia stormed the heights of Queenstown, and the British general, Brock, was killed; but reinforcements arriving opportunely, the heights were retaken, and nearly all the Americans were killed or driven into the Niagara, while the American general was in vain imploring a large body of militia on the opposite bank to cross over to the support of their brethren in arms. They refused, upon the ground, that the government had no constitutional right to send the militia across the frontier. The Federal party, opposed to the war, defended this doctrine, and General Van Rensselaer resigned in disgust. American disasters on the land were, however, compensated by victories at sea. August 19, the U. S. frigate *Constitution* captured the British frigate *Guerrière;* October 18, the *Wasp* took the *Frolic;* October 25, the frigate *United States* captured the *Macedonian;* December 29, the *Constitution* took the *Java.* The Americans in most cases had the larger ships and heavier ordnance; but the immense disparity in losses shewed also superior seamanship and gunnery. American privateers took 300 British vessels and 3000 prisoners. In 1813, General Proctor crossed the Detroit river with a considerable force of British and Indians, and defeated General Winchester, with the usual results of savage warfare. In April, an American army of 1700 men captured York (now Toronto), and about the same time another American force of 800 men was defeated with great loss by the Indians under Tecumseh; but the remainder of this campaign was wholly favourable to the Americans. The attempt of the British general, Prevost, on Sackett's Harbor was repulsed; the squadron on Lake Erie, consisting of 6 vessels, 63 guns, was captured by Commodore Perry at the head of an American flotilla of 9 vessels, 54 guns; and this latter success enabled General Harrison to invade Canada, where he defeated General Proctor in the battle of the Thames, in which the great Indian warrior-chief Tecumseh was killed. In 1813, another invasion of Canada was attempted; and York (now Toronto) was taken by General Dearborn; and an unsuccessful attempt was made to take Montreal. Villages were burned on both sides. The British also destroyed American shipping in Delaware Bay. At the same period, General Jackson defeated the Creek Indians in Alabama and Georgia, who had been excited to make war upon the frontier settlements.

In 1814, Generals Scott and Ripley crossed the Niagara, and sharp actions, with no decisive results, were fought at Chippewa and Lundy's Lane, close by the great Cataract. General Wilkinson also invaded Canada on the Sorell river, but was easily repulsed. A British invasion, by Lake Champlain, by General Sir George Prevost, with 14,000 men and a flotilla on the lake, was no more successful. On the 6th of September, the flotilla was captured by Com. Macdonough in the harbour of Plattsburg, while the army was repulsed on shore, and retreated with heavy loss. In August, a British fleet ascended Chesapeake Bay, took Washington with but slight resistance, and burned the government buildings. A subsequent attack on Baltimore was unsuccessful. New York, New London, and Boston were blockaded, and a large expedition was sent against Mobile and New Orleans. On the 8th of January 1815, General Packenham advanced with 12,000 men against the latter city, which was defended by General Jackson, at the head of 6000 militia, chiefly from Tennessee and Kentucky, aided by a small force of artillery, recruited from the Barataria pirates. The Americans were sheltered by a breastwork, and the British assault was met with so deadly a fire of riflemen, that it was repulsed, with the loss of General Packenham and several officers, with 700 killed and 1000 wounded; while the entire American loss is stated to have only amounted to 71. This ill-planned and unfortunate action was fought more than a month after peace had been concluded between England and America, and was followed by two naval actions in February and March. Though during this contest fortune at first favoured the Americans on the high seas, she changed sides completely from June 1813, as if to counterbalance the disasters of the British on land. June 1, the *Chesapeake* was taken by the *Shannon*; June 3, the *Growler* and *Eagle* were captured by British gun-boats; the *Argus* was taken by the *Pelican*, August 14; the *Essex* by the *Phœbe* and *Cherub*, March 29, 1814; the *President* by the *Endymion*, January 15, 1815; the only counterbalancing success being the sinking of the British sloop *Avon* by the *Wasp*, September 8, 1814. In December 1814, the Federalists of New England held a convention at Hartford in opposition to the war and the administration, and threatened a secession of the New England states. See Hartford Convention. In 1815, Commodore Decatur, who had taken a distinguished part in the recent war, commanded an expedition against the Algerians—whose corsairs had preyed on American commerce in the Mediterranean—and dictated terms to Algiers, Tunis, and Tripoli.

The Democratic Republican party having brought the war to a satisfactory conclusion, the Federalists disappeared; and in 1817, James Monroe was elected

to the presidency, almost without opposition, in what was termed 'the era of good feeling.' A rapid emigration from Europe and from the Atlantic states to the richer lands of the West, had in ten years added six new states to the Union. Difficulties arose with the warlike southern Indian tribes, whose hunting-grounds were invaded; and General Jackson, sent against the Seminoles, summoned to his aid the Tennessee volunteers who had served under him against the Creeks and at New Orleans, defeated them, pursued them into Florida, took Pensacola, and banished the Spanish authorities and troops. He was, however, supported in these high-handed measures by the President; and in 1819, Florida was ceded by Spain to the United States. In 1819—20, Alabama and Maine, a slave and a free state, were added to the Union; and the question of the admission of Missouri arose in Congress—the question of its admission with or without slavery. At the period of the Revolution, slavery existed in all the states except Massachusetts; but it had gradually been abolished in the northern and middle states, except Delaware, and excluded from the new states between the Ohio and Mississippi by the terms on which the territory had been surrendered by Virginia to the Union. Under the constitution, slaves were not counted in full as a represented population; but by a compromise, three-fifths of their numbers were added to the whites. The slave states were almost exclusively agricultural, with free-trade interests. The free states were encouraging manufactures by protection. The two sections had already entered upon a struggle to maintain the balance of power against each other. After an excited contest, Missouri was admitted, with a compromise resolution, that in future no slave state should be erected north of the parallel of 36° 30′ N. lat.—the northern boundary of Arkansas. During the second term of Mr Monroe, in 1824, General Lafayette visited America, and was everywhere received with great enthusiasm. In the presidential election of 1824, there were four candidates—John Quincy Adams, Andrew Jackson, Henry Clay, and William H. Crawford. There being no choice by the people, the House of Representatives chose Mr Adams; John C. Calhoun being elected Vice-president. Party and sectional feeling became stronger. Mr Adams and Mr Clay, who had heretofore acted with the party of Jefferson and Madison, were henceforth identified with what was called the National Republican, and later, the Whig, and finally, in union with the Anti-slavery party, the Republican party. In 1826, two of the founders of the republic, John Adams and Thomas Jefferson, died on the 4th of July, the anniversary of the Declaration of Independence—an event which made a profound impression. The four years of Mr Adams, during which there were violent contests on protection and the powers of the Federal government to carry out public works within the states, ended with an excited election contest, which resulted in the triumph of the Democratic party and the election of Andrew Jackson, with John C. Calhoun as Vice-president. The bold, decisive, and impetuous character of General Jackson was shewn in a general removal of those who held office, down to small postmasters and tide-waiters, under the late administration, and the appointment of his own partisans. An act for the rechartering of the U. S. Bank was met by a veto of the President, who declared it unconstitutional and dangerous. In 1832, an Indian war, called the Black Hawk War, broke out in Wisconsin; but the passing of a high protective tariff act by Congress caused a more serious trouble. The state of South Carolina declared the act unconstitutional, and therefore null and void, threatening to withdraw from the Union if an attempt were made to collect the duties on foreign importations. The President prepared to execute the laws by force; Mr Calhoun resigned his office of Vice-president, and asserted the doctrine of state-rights, including the right of secession, in the Senate. A collision seemed imminent, when the affair was settled by a compromise bill, introduced by Henry Clay, providing for a gradual reduction of duties, until 1843, when they should not exceed 20 per cent. *ad valorem.*

The popularity of General Jackson caused his re-election by an overwhelming majority against Henry Clay, the leader of the Bank, Protection, and Internal Improvement party; and he entered upon his second term with Martin Van Buren of New York as Vice-president. The removal of the government deposits from the U. S. Bank to certain state banks, led to the failure of the bank, and after some years, to the adoption of Mr Van Buren's plan of an independent treasury. The Cherokee Indians in Georgia, who had attained to a certain degree of civilisation, appealed to the President for protection against the seizure of their lands by the state; but they were told that he 'had no power to oppose the exercise of the sovereignty of any state over all who may be within its limits;' and the Indians were obliged to remove to the territory set apart for them west of the Mississippi. In 1835, the Seminole war broke out in Florida; and a tribe of Indians, insignificant in numbers, under the crafty leadership of Osceola (q. v.), kept up hostilities for years, at a cost to the U. S. of several thousands of men and some fifty millions of dollars. In 1837, Martin Van Buren succeeded General Jackson in the presidency. His term of four years was a stormy one, from the great financial crisis of 1837, which followed a period of currency-expansion and wild speculation. All the banks suspended payment, and the great commercial cities threatened insurrection. Mr Van Buren was firm in adhering to his principle of collecting the revenues of the government in specie, and separating the government from all connection with the banks. His firmness in acting against the strong sympathies of the northern and western states with the Canadian insurrection of 1837—1838, also damaged his popularity; and in 1840, the election of General Harrison, with John Tyler for Vice-president, was one of unexampled excitement, characterised by immense popular gatherings, political songs, the use of symbols, and the participation of both sexes to a degree hitherto unknown in America. The Whigs triumphed in nearly every state; General Harrison was inaugurated March 4, 1841; and the rush to Washington for offices was as great as the election had been exciting and remarkable. Worn down with the campaign and the office-seekers, General Harrison died in a month after his inauguration, and was succeeded by John Tyler, who, having been a Democrat, was no sooner in power than he seems to have reverted to his former political principles. He vetoed a bill for the establishment of a national bank and other measures of the party by which he had been elected. His cabinet resigned, with the exception of Daniel Webster, Secretary of State, and others, Democratic or neutral, were appointed in their place. During Mr Tyler's administration, the north-eastern boundary question, which nearly occasioned a war with England, was settled by Mr Webster and Lord Ashburton; a difficulty amounting almost to a rebellion, was settled in Rhode Island; but the most important question agitated was that of the annexation of Texas. This annexation was advocated by the South, as a large addition to southern and slave territory; and, for the same reason

opposed by the Whig and anti-slavery parties of the North. Besides, the independence of Texas, though acknowledged by the U. S., England, and France, had not been acknowledged by Mexico, and its annexation would be a *casus belli* with that power. The recent admissions of Iowa and Florida into the Union had kept the balance of power even between North and South, but Texas would be an advantage to the South. But the gain of territory, and a contempt for Mexico, overcame these objections, and in 1845, Texas was formally annexed to the U. S.; and James K. Polk of Tennessee succeeded Mr Tyler in the presidency.

M. Almonte, the Mexican minister at Washington, protested against the annexation of Texas, as an act of warlike aggression; and to guard against a threatened invasion of Texas, General Zachary Taylor was ordered, with the U. S. troops of his military district, to its southern frontier. The Mexicans crossed the Rio Grande, and commenced hostilities, April 26, 1845. In March 1846, General Taylor moved forward, and won the victories of Palo Alto, Resaca de la Palma, Monterey, Saltillo, and finally, against great odds—20,000 to 4759—in Feb. 1847, the hard-fought battle of Buena Vista, a victory that excited great enthusiasm. In the meantime, General Wool had been sent on an expedition to Chihuahua, in Northern Mexico; General Kearney to New Mexico; and Captain Fremont and Commodore Stockton took possession of California. March 9, 1847, General Scott landed at Vera Cruz, which he took on the 29th, after a siege and bombardment by land and water. Marching into the interior with a force of about 9000 men, he found General Santa Anna intrenched on the heights of Cerro Gordo with 15,000 men. On April 18, every position was taken by storm, with 3000 prisoners, 43 cannon, 5000 stand of arms, &c. Waiting at Puebla for reinforcements until August, General Scott advanced with 11,000 men towards Mexico, near which General Santa Anna awaited him with large forces and in strong positions. On the 19th and 20th of August were fought the battles of Contreras and Churubusco, in which 9000 Americans vanquished an army of over 30,000 Mexicans in strongly fortified positions. After a brief armistice, hostilities recommenced on the 7th September; and after a series of sanguinary actions, the American army, reduced to about 8000, entered the city of Mexico, which ended the war. By the treaty of Guadalupe, the U. S. obtained the cession of New Mexico and Upper California, the U. S. paying Mexico $15,000,000, and assuming the payment of the claims of American citizens against Mexico. The opposition to the annexation of Texas, and to the war and the acquisition of the newly-acquired territory, became now complicated and intensified by sectional feelings and the opposition to slavery. The Northern party demanded that slavery should never be introduced into territories where it had not existed; the South claimed the right of her people to emigrate into the new territories, carrying with them their domestic institutions. During the debates on the acquisition of the Mexican territories, Mr Wilmot of Pennsylvania introduced an amendment, called the 'Wilmot Proviso,' providing that there should be neither slavery nor involuntary servitude in the acquired territory. This was voted down, but became a party principle. In 1849, General Taylor, the 'Rough and Ready' victor of Buena Vista, became President, with Millard Fillmore as Vice-president. The Free-soil party * had nominated Martin Van Buren, with Charles Francis Adams for Vice-president; the Democratic candidate being General Lewis Cass. The Liberty party in 1840 had cast 7609 votes; in 1844, it had 62,300, Mr Van Buren in 1848 received 291,263, so rapid was the growth of a party soon destined to control the policy of the government. September 1, 1849, California, rapidly peopled by the discovery of gold, adopted a constitution which prohibited slavery. Violent struggles and debates in Congress followed, with threats of secession, and protests against interference with slavery. The more zealous abolitionists of the North denounced the constitution for its support of slavery, and its requirement of the return of fugitive slaves to their owners, and threatened separation. The South denounced the violation of the constitution by interference with slavery—a domestic institution of the states—the carrying off of negroes secretly by organised societies, and what was termed the 'Underground Railway,' and the passage of personal liberty bills in several states, which virtually defeated the requirements and guarantees of the Fugitive Slave Law. Mr Clay introduced a compromise into Congress, admitting California as a free state, and introducing a new and more stringent law for the rendition of fugitive slaves. President Taylor, more used to the rough life of a frontier soldier than the cares of state, died July 9, 1850, and was succeeded by Mr Fillmore.

The election of Franklin Pierce in 1852, against General Scott, was a triumph of the Democratic, States' Rights, and Southern party. Jefferson Davis, a senator from Mississippi, a son-in-law of General Taylor, and who had served under him in Mexico, was appointed Secretary of War. New elements were added to the sectional controversies which agitated the country by the repeal of the Missouri Compromise, and the passage of the Kansas-Nebraska bill of Senator Douglas, which left the people of every territory, on becoming a state, free to adopt or exclude the institution of slavery. The struggles of Kansas, approaching a civil war between the Free-soil and Pro-slavery parties in that rapidly growing territory, resulted in the exclusion of slavery. A brutal assault upon Mr Sumner, senator from Massachusetts, by a Southerner, named Preston Brooks, in consequence of a violent speech on Southern men and institutions, increased the excitement of both sections. The formation of an Anti-foreign and No-popery party, called the 'Know-nothing' party, acting chiefly through secret societies, was a singular but not very important episode in American politics, though it may have influenced the succeeding election.

In 1856, the Republicans, composed of the Northern, Free-soil, and Abolition parties, nominated John C. Fremont for the presidency, while the Democratic and States' Rights party nominated James Buchanan. Ex-president Fillmore received the Know-nothing nomination. The popular vote was—for Buchanan, 1,838,169; Fremont, 1,341,264, Fillmore, 874,534. Mr Buchanan was inaugurated March 4, 1857, with John C. Breckinridge, afterwards a general of the Confederate army, as Vice-president. A difficulty with the Mormons, which caused the President to send a military force to Utah, was settled without bloodshed. The efforts of the government to execute the Fugitive Slave Law kept up an irritated feeling. There were savage fights between the northern and southern parties in Kansas, and on the western borders of Missouri. Resolute and well-armed settlers were sent out by New England emigration societies. In October 1859, John Brown, known in Kansas as 'Ossawattamie Brown,' who, with his sons, had been engaged

* The Free-soil party opposed the extension of slavery by the admission of new slave states, while recognising its legal and constitutional existence where already established.

in the struggles in Kansas, planned and led an expedition for freeing the negroes in Virginia. He made his attempt a. Harper's Ferry, on the Potomac, where, after a vain attempt to induce the negroes to join him, he and his small party took possession of one of the government workshops, where he was taken prisoner by a party of U. S. soldiers, and handed over to the authorities of Virginia, tried and executed, December 2. His body was taken to his home in New York for burial, and he was regarded by the Abolition party as a martyr.

In 1860, the Democratic party, which, except at short intervals, had controlled the Federal government from the election of Jefferson in 1800, became hopelessly divided. The Southern delegates withdrew from the convention at Charleston, and two Democratic candidates were nominated, Stephen A. Douglas of Illinois, and John C. Breckinridge of Kentucky; while the Republicans, or united Whig and Abolition party, nominated Abraham Lincoln of Illinois; and the Union or American Party nominated John Bell of Tennessee. The Republican convention adopted a moderate and even a conservative 'platform' of principles, denounced the John Brown raid, and put forward as a principle, 'the maintenance inviolate of the rights of the states, and especially the right of each state to order and control its own domestic institutions according to its own judgment exclusively.' Still, the country was sectionally divided, and all who had laboured to limit and destroy the Southern institution of slavery were acting with the Republican party.

At the election of November 1860, Mr Lincoln received every Northern vote in the electoral college, excepting three of New Jersey, which were given to Mr Douglas, 180 votes; Mr Breckinridge received 72 electoral votes; Mr Bell, 39; Mr Douglas, 12. The North and South were arrayed against each other, and the South was beaten. Of the popular vote, Mr Lincoln received 1,857,610; Mr Douglas, 1,365,976; Mr Breckinridge, 847,951; Mr Bell, 590,631. Thus, while Mr Lincoln gained an overwhelming majority of the electoral votes given by each state, the combined Democratic votes exceeded his by 356,317, and the whole popular vote against him exceeded his own by 946,948. A small majority, or even plurality, in the Northern states was sufficient to elect him.

The South lost no time in acting upon what her statesmen had declared would be the signal of their withdrawal from the Union. On the 10th of November, as soon as the result was known, the legislature of South Carolina ordered a state convention, which assembled December 17, and on the 20th unanimously declared that 'the union now subsisting between South Carolina and other states, under the name of the United States, is hereby dissolved;' giving as a reason that 14 of these states had for years refused to fulfil their constitutional obligations. The example of South Carolina was followed by Mississippi, January 9, 1861; Florida, 10th; Alabama, 11th; Georgia, 19th; Louisiana, 26th; Texas, Feb. 1; Virginia, April 25; Arkansas, May 6; North Carolina, 21st; Tennessee, June 8. Kentucky and Missouri were divided, and had representatives in the governments and armies of both sections.

On the 4th of February 1861, delegates from the seven then seceded states met at Montgomery, Alabama, and formed a provisional government, under the title of the 'Confederate States of America.' A constitution was adopted much like that of the U. S., and the government fully organised, February 13, 1861; President, Jefferson Davis of Mississippi; Vice-president, Alexander H. Stephens of Georgia; and, May 24, established at Richmond, Virginia. The secession movement appears to have been nearly unanimous in the more Southern states, and to have been carried by more or less decided majorities. As state after state withdrew from the Union, its senators and representatives in Congress at Washington resigned their seats; and nearly all the officers of the army and navy, of Southern birth, believing that their first and final allegiance was due to their states, and that the action of each state carried with it all its citizens, also resigned their commissions, and tendered their swords to their respective states, and to the Confederacy they ha formed.

President Buchanan, doubting his constitutional power to compel the seceding states to return to the Union, made a feeble and ineffectual attempt to relieve the garrison of Fort Sumter, in Charleston harbour, closely besieged by the forces of South Carolina. Commissioners were sent to Washington to negotiate for the settlement of the claims of the Federal government, and great efforts were made to effect compromises of the difficulties, but without result.

On the 4th of March 1861, President Lincoln was inaugurated at Washington. In his address, he said: 'I have no purpose, directly or indirectly, to interfere with the institution of slavery in the states where it exists. I believe that I have no lawful right to do so, and I have no inclination to do so.' On the 7th of April, a naval expedition set sail from New York for the relief of Fort Sumter; and its arrival off Charleston Harbour was the signal for the commencement of a bombardment of the fort by the Confederate batteries of General Beauregard. The surrender of the fort, April 13, was followed by a sudden outburst of indignation in the North. The government called out 75,000 volunteers, large numbers of whom were in a few days marching to the defence of Washington. April 18, the Confederates seized the U. S. arsenal at Harper's Ferry, and took or destroyed a large quantity of arms and machinery. On the 20th, the navy-yard, near Norfolk, Va., was destroyed by the U. S. officers, and five large men-of-war burned or sunk, to prevent their falling into the hands of the Confederates. Opposed to the Federal volunteers assembled at Washington, the Confederates took up a position at Bull Run, a few miles distant from the Potomac, under General Beauregard, where they were attacked by General M'Dowell. A severe action resulted in the repulse and complete panic of the Federals, who hastily retreated to Washington. Congress saw that it must act in earnest, and that the rebellion was not to be put down in 90 days by 75,000 volunteers. It voted to call out 500,000 men. The Confederate States had a population of 5,582,122 free inhabitants, and 3,519,902 slaves; total, 9,102,024; and though the negroes were not called into the field except as labourers, they were not less useful in supplying the armies, by carrying on the agricultural labour of the country. The Confederates had also the strong sympathy and aid of the four slaveholding border states, prevented by their position from seceding—Delaware, Maryland, Kentucky, and Missouri.

Holding their position in Virginia, the Confederates erected fortifications on the Tennessee and Cumberland rivers, and on important points of the Mississippi, from Columbus, in Kentucky, to its mouth. They also made a strong effort to secure the state of Missouri, as well as to defend the seaports through which they must receive their most important supplies from abroad. The Federal government, on its side, blockaded the whole line of coast from Virginia to Texas, and sent large

forces to secure the doubtful states. Gun-boats were rapidly built for the rivers of the west, and vessels purchased and constructed for the navy. In December 1861, the Federals had 640,000 men in the field; and the Confederates had 210,000, and had called for 400,000 volunteers.

The first important operation of 1862 was the taking the defences of the Cumberland and Tennessee rivers (Feb. 6, and 16), which led to the occupation of Nashville, the capital of Tennessee, henceforth held by the Federals—Andrew Johnson, formerly governor and senator, having been appointed military governor. Roanoke Island was also captured, on the coast of North Carolina. In March, General M'Clellan, who had succeeded the aged Lieutenant-general Scott as commander-in-chief, commenced a movement on Richmond, the seat of the Confederate government, now defended by General Lee. On the 8th of March, the Confederate iron-clad *Virginia*, constructed from the U. S. steamer *Merrimac*, which had been sunk at Norfolk, and raised by the Confederates, attacked the Federal fleet in Hampton Roads, and in 40 minutes sunk the *Cumberland*, and set on fire and captured the *Congress* (frigates); while the other vessels took refuge in shoal water or in flight. The next day, the *Monitor*, a war-vessel of entirely novel construction, low and flat, with a revolving turret, invented by Captain Ericsson, engaged the *Virginia*. The battle ended in the repulse of the *Virginia*. On the 6th of April, a sanguinary but indecisive battle was fought near Corinth, Alabama, the Federals being protected by gun-boats. Soon after, Admiral Farragut, with a fleet of 45 vessels, carried the forts at the mouth of the Mississippi river, and took New Orleans; while the armies and gun-boats captured the fortifications on the upper part of the river as low as Memphis, Tennessee. In the meantime, General M'Clellan had besieged and taken Yorktown, and fought his way up the peninsula of the James River, until within five miles of Richmond, when he was beaten in a series of sanguinary battles, and driven, with a loss, in six days, of 15,000 men, to the shelter of his gun-boats; while Generals Banks and McDowell, sent to co-operate with him in the Shenandoah Valley, were defeated and driven back by General 'Stonewall' Jackson. On the 1st of July, the President called for 300,000, and August 4, 300,000 more men for the Federal army. Congress abolished slavery in the district of Columbia, prohibited it in the territories, and passed a resolution to compensate the masters in any state that would abolish slavery. They also authorised the President to employ negroes in the army, and to confiscate the slaves of rebels. In August, the Federals were a second time defeated at Bull Run, and General Lee crossed the Potomac into Maryland, creating great alarm in Washington, and even in Philadelphia. General M'Clellan made a rapid march, and met him at Sharpsburg or Antietam. The battle resulted in the defeat and retreat of General Lee, covering an immense train of provisions, horses, cattle, &c., which was probably the object of his expedition. A Confederate invasion of Kentucky, about the same time, was attended with similar results. Another advance on Richmond was led by General Burnside, who had superseded General McClellan; but he was confronted by General Lee at Fredericksburg, and defeated in one of the most sanguinary battles of the war. President Lincoln issued the "Emancipation Proclamation," declaring the freedom of all the slaves in the rebel states. This measure, though not strictly constitutional, was justified by military necessity. While the army of the Potomac was vainly endeavouring to advance on Richmond, the army of the Tennessee, under General Rosecrans, with its base at Nashville, was trying to sever the Atlantic from the Gulf States, and cut off the railways that supplied the Confederate armies in Virginia. At Murfreesborough, Tennessee, the Confederate General Bragg attacked General Rosecrans, but was repulsed in the battle of Stone River, and fell back to Tullahoma.

Early in May 1863, General Hooker, who had succeeded General Burnside in the command of the army of the Potomac, crossed the Rappahannock, and was defeated by General Lee at Chancellorsville with great slaughter; but this victory was dearly bought by the loss of General Jackson, mortally wounded in mistake by his own soldiers. General Lee now took the offensive, and invaded Pennsylvania, advancing as far as Harrisburg; but being met by General Meade, the new commander of the army of the Potomac, he attacked him in a strong position at Gettysburg, was defeated with severe loss, and compelled to recross the Potomac. In the meantime, the two principal fortresses of the Mississippi, Vicksburg and Port Hudson, attacked by land and water, after a long siege, were starved into capitulation, and the entire river was open to Federal gun-boats. Charleston, blockaded since the beginning of the war, was now strongly besieged—its outworks, Forts Gregg and Wagner, taken, Fort Sumter battered in pieces, but still held as an earthwork, and shells thrown a distance of five miles into the inhabited part of the city. In September, General Rosecrans had taken the strong position of Chattanooga, Tennessee, and penetrated into the north-west corner of Georgia, where he was checked by General Bragg at the battle of Chickamauga. At this period, there were great peace-meetings in the North, terrible riots in New York against the conscription and the negroes; while the banks having suspended specie payments, the paper-money of both Federals and Confederates was largely depreciated. The Confederates were, however, cut off from all foreign aid, except what came to them through the blockade, and their own resources, both of men and material, were becoming exhausted. The railways were worn, many destroyed or occupied by the Federals, and it became difficult to transport supplies and feed armies. The Federals had command of the sea, and access to all the markets of Europe.

At the commencement of 1864, the United States held, including the garrisons on the Mississippi, nearly 100,000 prisoners of war. The Southerners also had about 40,000 Federal prisoners, whom they could feed with difficulty, and who suffered great hardships. General Ulysses S. Grant, who had been successful at Vicksburg, was appointed commander-in-chief of the Federal armies, and commenced a vigorous campaign over an immense area—in Virginia, the Carolinas, Georgia, Louisiana, and Arkansas, with the determination 'to hammer continuously against the armed forces of the enemy and his resources, until by mere attrition he should be forced to submit.' Of the Confederates, General Lee defended Petersburg and Richmond; General J. E. Johnston opposed the army of Tennessee at Dalton, Georgia; General Forrest was in Mississippi; General Taylor and Kirby Smith commanded in Louisiana and Arkansas. In February, General Sherman marched from Vicksburg, making a destructive raid across Northern Mississippi to Alabama. In March, the Federals had 1,000,000 of men raised and provided for. The entire Confederate forces probably numbered 250,000. The army of the Potomac, commanded by General Meade, under the personal superintendence of General Grant, covered

Washington, and advanced toward Richmond. General Butler advanced from Fortress Monroe up the James River; General Sigel marched up the Shenandoah. Sherman united the armies of Tennessee, Cumberland, and Ohio, at Chattanooga, where he had nearly 100,000 men and 250 guns. General Banks had 61,000 men in Louisiana. In March, General Banks moved up the Red River, toward Shreveport, but was defeated on the 24th, and driven back to New Orleans. In May the campaign of Virginia commenced, and the army of the Potomac fought a series of battles at the Wilderness, Spottsylvania Court-house, Jericho's Ford, North Anna, and Cold Harbour, with terrible losses. After each battle, the United States forces took up a new position farther south, with a new base, until they had made half the circuit of the Confederate capital. General Breckinridge defeated Sigel in the Shenandoah valley, and once more threatened Washington. General Sheridan, with a strong cavalry force, drove back the Confederates, and laid waste the valley. In September, General Sherman, advancing with a superior force, captured Atlanta. General Hood, superseding Johnston in the command of the Confederates, was out-generalled and beaten. While he marched west to cut off General Sherman's base and attack Nashville, where he was defeated, Sherman burned Atlanta, destroyed the railway, and marched boldly through Georgia to Savannah. The Confederates made strong efforts, but they were unable to gain any advantages.

In 1865, the U. S. government made a new draft for 500,000 men. Expeditions were organized against Mobile. Wilmington, the most important Confederate port, was taken by a naval and military expedition. Savannah and Charleston, approached in the rear by Sherman, were evacuated. Cavalry raids cut off the railways and canal that supplied the Confederate army in Petersburg and Richmond. Finally, on March 29, 1865, a series of assaults was made upon the Confederate works, during ten days of almost continual fighting, until the Confederates were worn down with fatigue. Richmond and Petersburg were evacuated April 2; and on the 9th, after several conflicts, General Lee surrendered at Appomatox Court-house, his army numbering 28,000. At this period, it is said that there was not lead enough remaining in the Confederate States to fight a single battle. On the 12th, Mobile surrendered with 3000 prisoners and 300 guns. Then General Johnston, in North Carolina, surrendered a few days after to General Sherman; and the Trans-Mississippi Confederate army followed his example.

Mr Lincoln had been triumphantly re-elected to the presidency, with Andrew Johnson as Vice-president. On April 14, while the North was rejoicing over the capture of Richmond and the surrender of the Confederate armies, the President was assassinated at a theatre in Washington, by John Wilkes Booth, an actor; while an accomplice attacked and nearly killed Mr Seward, Secretary of State. The assassin was pursued and killed, and several of his accomplices were tried and executed, and others imprisoned on the Dry Tortugas, on the coast of Florida. Andrew Johnson became President. Jefferson Davis and the members of the Confederate government were supposed to be privy to the assassination of President Lincoln, and large rewards were offered for their apprehension. Mr Davis was captured in Georgia, and placed in Fortress Monroe on the 15th of Nov., 1865, but was released May 13, 1867, without trial. Immediately after the close of the war the President pardoned most of the prominent actors in the rebellion, and in 1866 proclaimed the restoration to the Union of all the seceded states; but their senators and representatives were not permitted to take their seats until a later date. 800,000 men were paid off and mustered out of the service.

During the war, the number of men called for by the Federal government was 2,759,049; the number actually furnished by the states was 2,653,062, when at the close of the war the drafts were discontinued. Of coloured troops, mostly recruited from the slaves, there were 186,097. By aid of railway lines, the armies sometimes made rapid marches; 23,000, with artillery, baggage, and animals, passed from Rapidan, Virginia, to Stephenson, Alabama, 1192 miles, twice crossing the Ohio, in 7 days. Railways were many times destroyed and repaired. Etowah Bridge, 625 feet long and 75 feet high, having been burned, was rebuilt by 600 men in 6 days. Chattahoochie Bridge, 740 feet long and 90 feet high, was rebuilt by 600 men in 4½ days.

The Federal losses during the war are estimated at 316,000. The state of New York, with a population of nearly 4,000,000, sent 223,836 volunteers, of whom 125,000 remained at the close of the war. The state of Pennsylvania, with a population of about 3,000,000, sent 362,284 volunteers, and issued 43,000 military commissions. There was an annual waste of one-third, half of which was by wounds in battle.

The statistics of the Confederate forces are imperfect. In 1864, the army consisted of 20,000 artillery, 128,000 cavalry, and 400,951 infantry; total 549,226, commanded by 200 general officers. The losses are unknown. See also UNITED STATES in SUPP. in Vol. X.

U'NIVALVES, in Conchology, are those shells which consist of only one piece. They are mostly the shells of gasteropodous molluscs, but some cephalopodous molluscs also have univalve shells, as the argonaut and nautilus, and even animals belonging to other divisions of the animal kingdom, particularly a few annelids, as *Serpula*, and the *Foraminifera*. There is, however, a difference in the structure of the shells, as well as of the animals to which they belong. In systems of Conchology, when the shell alone was regarded, and the animals had not yet been much studied, the usual division of U. was into *Unilocular* and *Multilocular*, the latter being the shells divided into chambers, as in the nautilus. The whole arrangement, however, was unnatural, bringing together in one group creatures widely different, and separating groups which in reality are very closely allied; for the mere presence or absence of a shell is often comparatively an unimportant circumstance, as amongst gasteropodous molluscs, in the case of snails and slugs, the near relation between which is manifest even to an unscientific observer. A naturalist knows by the mere shell, recent or fossil, the group to which the creature belonged, of which it was once the covering; he can not only tell the shell of a foraminifer or an annelid from that of a mollusc, and distinguish the shell of a cephalopod from that of a gastropod, but he can even decide as to the order of gastropods, and pronounce with confidence as to some of the habits of the animal. There are marked peculiarities in the U. of different geological periods well known and of great interest to geologists. 'The gastropods which first appear in the palæozoic strata have entire mouths; the siphonated species are not found lower than the lias, and they go on increasing in numbers in and from the tertiary series to the actual sea-shores.' These differences in the mouth of the spiral shell of a gastropod are connected with important differences in the organs of respiration. See GASTEROPODA and MOLLUSCA.

UNIVE'RSALISTS, a body of Christians whose distinctive peculiarity consists in their belief that 'evil' will ultimately be eradicated from the world, and that all erring creatures will be brought back to God through the irresistible efficacy of Christ's divine love. The grounds on which their faith in the final salvation of all men rests are derived more, perhaps, from reason than from Scripture; and when they *do* appeal to the latter, it is rather to the spirit and design of the Gospel than to particular passages. They argue, that when an infinitely wise, holy, and benevolent God resolved to create man, it could only be with a view to his everlasting good; that if he did allow him to be tempted and fall, it must have been because he foresaw that through sorrow and suffering man could rise to higher degrees of perfection; that therefore all punishment (or what, with our limited knowledge, we conceive to be such) is of necessity designed as a remedial agent, and not intended to satisfy God's indignation as a sovereign at the disobedience of his subjects; that no other view of the subject is compatible with the Scriptural, and especially the New Testament representation of God as a 'Father,' or with the oft-repeated declaration (in various terms) that Jesus Christ was a propitiation for the sins of the whole world. In answer to those who adduce against them the express language of Scripture; e. g., 'And these shall go away into everlasting punishment: but the righteous into life eternal' (Matthew, xxv. 46), they reply, that the word *aiōnios*, translated 'everlasting,' does not necessarily bear that signification; that properly it does not express the idea of duration at all, either finite or infinite, but was rather used by the sacred writers to denote a mode of existence distinct from and wholly dissimilar to any mere *chronic* state; in proof of which they point to such passages as—'*This is life eternal*, that they might know thee, the only true God, and Jesus Christ, whom thou hast sent' (John, xvii. 3), where eternal life is affirmed to be *knowledge*—that is, a present state of mind, and not a perpetual hereafter of duration.

U., it may be observed, generally differ from the prevalent bodies of Christians in other important doctrines, though it is not because of such differences that they have received their name, nor is it necessary to merit the name that one should share these differences. Most of them agree with Unitarians—but there are eminent examples to the contrary—in rejecting the doctrine of the Trinity; they are also Pelagian in the matter of original sin, and reject the notion that the new birth is something supernatural.

Universalism, as a mode of belief, is of very ancient origin, and its modern adherents, besides urging its congruity with the divine plan of redemption, as revealed in Scripture, point to the earliest Christian writings; e. g., the *Sibylline Oracles* (150 A. D.—see SIBYL)—expressly composed to convert pagans to Christianity—as evidence that the doctrine was recognised from the first. Passages in favour of the doctrine are cited from many of the church fathers—Clemens Alexandrinus; Origen; Marcellus, Bishop of Ancyra; Titus, Bishop of Bostra; Gregory, Bishop of Nyssa; Didymus the Blind, president of the Catechetical School of Alexandria; Diodorus, Bishop of Tarsus; Theodore, Bishop of Mopsuestia; and Fabius Marius Victorinus. It is said to have been held by some of the Albigenses and Waldenses, the Lollards and the Anabaptists, and it probably had isolated supporters in most of the countries into which the Reformation penetrated. Nor has it wanted illustrious adherents belonging to the Church of England and the Nonconformists, among whom it is customary to rank Archbishop Tillotson, Dr Burnet, Bishop Newton, Dr Henry More, William Whiston, Jeremy White (chaplain to Oliver Cromwell), Soame Jenyns, David Hartley, William Law, and (in our own day) Thomas de Quincey and Professor Maurice. The same remark is applicable to the French Protestant and German Churches, and indeed it may safely be asserted that the *non-clerical* mind in all ages is disposed to look favourably upon the doctrine of the universal restoration to holiness and happiness of all fallen intelligences, whether human or angelic. Hence the irrepressible sympathy of men, however orthodox, with the language of Burns:

> Then, fare ye weel, auld Nickie Ben.
> Oh, wad ye tak a thocht, and men'
> Ye aiblins micht—I dinna ken—
> Still hae a stake.
> I'm wae to think upo' yon den,
> E'en for your sake.

But the existence of U. as a distinct religious sect is a feature of American rather than of English religious society. About the year 1770, the Rev. John Murray became a propagator of Universalist views; and since his time, an organised body has sprung up, which contains many able, learned, and pious divines. According to the 'Register' of the denomination published in 1871, there are in the United States 904 parishes, owning 687 churches, and ministered to by 621 preachers. These societies have under their patronage 10 institutions of learning, including 4 colleges and 7 academies, and they support 13 periodicals. Various missionary, tract, and Sunday school associations are also employed in teaching and propagating their peculiar views.—See *Ancient History of Universalism*, by the Rev. Hosea Ballou; and the *Modern History*, by the Rev. Thos. Whittemore (Bost. 1830; new edit., 1860 *et seq.*).

UNIVERSAL LEGATEE is a legatee to whom the whole estate of a deceased party in Scotland is given, subject only to the burden of other legacies and debts. It nearly corresponds to residuary legatee in England.

UNIVE'RSITY (Lat. *universitas*, corporation), a corporation of teachers or students instituted for the promotion of the higher education. Mr Kirkpatrick, in his *Historically Received Conception of a University* (Lond. 1857), points out the prototype of the universities of modern Europe in the schools of Isocrates and Plato at Athens, and the Museum at Alexandria. These institutions certainly much resembled the university of after-times, both in their objects and their organisation; and in Greece and Rome, as well as in the later Byzantine Empire, something analogous to the degree was conferred on those who had successfully passed through the *trivium* or *quadrivium*, which together comprised what was regarded as the seven liberal arts and sciences. The university is, however, usually considered to have originated in the 12th or 13th c., and to have grown out of the schools which, prior to that period, were attached to most of the cathedrals and monasteries, providing the means of education both to churchmen and laymen, and bringing together the few learned and scientific men who were to be found in Europe. Such an institute of the higher learning was at first called *studium* or *studium generale*. When a teacher of eminence appeared, such as Abelard or Peter Lombard at Paris, or Irnerius at Bologna, a concourse of admiring students flocked round him; and the members of the *studium generale* formed themselves, for mutual support, into a corporation on which the general name of *universitas* came to be bestowed.

In this way, the oldest universities arose spontaneously. The crowds drawn from every country of Europe to Paris, Bologna, and other educational resorts, had first local immunities bestowed on them for the encouragement of learning, and to prevent them removing elsewhere; and the academical societies thus formed were by papal bulls and royal charters constituted an integral part of the church and state. One great difference existed between the constitution of the two most important universities of early times. In Paris, the teachers alone constituted the corporation; in Bologna, the university consisted of the students or scholars, who at first held the supreme power, and appointed the academic officials. In this respect, Bologna became the model of the subsequent universities of Italy and the provincial universities of France, which were corporations of students; while the universities of Britain, Germany, Holland, and Scandinavia were like Paris corporations of teachers, and the Spanish universities occupied an intermediate position. Along with a general resemblance, there was much difference in the constitution and character of the pre-Reformation universities, the form of each being the result of a combination of various circumstances and ideas acting on an originally spontaneous convocation of teachers and scholars.

The several *faculties* of a university are subordinate corporations, consisting of the aggregate of students or teachers in a particular department of knowledge. The number of faculties has varied much in different universities. The university of Paris had at first only a faculty of arts, which, as early as 1169, existed as a separate body, with an organisation of its own. Faculties of theology, medicine, and canon law were added in the 13th century. Bologna was at first exclusively, as it continued to be pre-eminently, a school of law. Oxford and Cambridge, in their origin, existed only in the faculty of arts. Some of the smaller French universities, as Orleans and Montpellier, were prohibited from teaching theology, lest they should become rivals to Paris.

The granting of degrees was the mode in which the university reproduced itself. A degree is the recognition of a student having made a certain advance in his career, the degree of Doctor or Master, in its original idea, entitling the person on whom it was conferred to teach within the limits of the university. Towards the end of the 13th c., Pope Nicholas I. granted to the university of Paris the right of endowing its graduates with the power of teaching everywhere; and this universal degree, making the recipient of it a member of the community of the learned throughout Christendom, became a link of connection between the universities of Europe. The designation of *Bachelor*, borrowed from the term indicating the probationary stage of knighthood, and implying the lowest stage of university honour, or the condition of an imperfect graduate, was first introduced in the 13th c. in the university of Paris, where the bachelor, though intrusted with certain tutorial functions, possessed no legislative power. The right of teaching (*regendi*) belonged to the master, doctor, or other perfect graduate; and a period of necessary regency was generally fixed, during which the graduates were bound to teach, and after the expiry of which they were at liberty to become non-regents. It, in the course of time, became the practice to endow a select number of the graduates as public authorised teachers; these privileged and salaried graduates were designated *Professors*, and instruction by professors more or less supplanted the original plan of teaching by graduates.

The poverty of a proportion of the students, and the desirableness of domestic superintendence, suggested the institution of halls endowed with property and corporate privileges, called *Colleges*. Though originally a provision for poor scholars, they soon assumed the character of boarding-houses for all classes of students, where they were privately trained and prepared for the public lectures. Colleges seem to have been first introduced in Paris, where most of them became appropriated to a particular faculty, or department of a faculty. The college of the Sorbonne, founded in 1250, came to be in a great measure identified with the theological faculty. Regent masters were named by the faculties as lecturers in the colleges, attendance on whom was made equivalent to attendance on the public courses in the schools of the university, and eventually the college lectures were thrown open to all members of the university; and it became obligatory in the faculty of arts, and usual in the other faculties, to become a member of some college.

The two highest university officers have generally been the *Rector* and the *Chancellor*, the former being the head of the university in everything except the granting of degrees, which are conferred by the latter as the fountain of honour. Besides the division into faculties, there was in most of the continental universities a division of the graduates and students into *nations*, in respect of the countries to which they belonged. In Paris, the faculty of arts was divided into four nations, known as French, Picard, Norman, and German or English; and after the 13th c., these four nations, under their respective procurators, and the three subsequently added faculties under their deans, constituted the seven component parts of the university. The rector, with the procurators and deans, formed a court having cognizance of all matters relating to discipline, from which there was an appeal to the university, and from thence to the parliament of Paris. In Bologna, after faculties of philosophy, medicine, and theology had been added to those of civil and canon law, the students were classed as *ultramontani* and *citramontani*, and each class divided into nations, presided over by their several counsellors or procurators.

The university, with modifications called for by the altered circumstances of society, has survived the revolutions of seven centuries. At present, Europe possesses about 100 universities, some dating from the 12th and 13th centuries, and others of various degrees of antiquity, including some founded in the present century. About 30 belong to Germany, and 20 to Italy; Holland, Belgium, Scandinavia, Spain, Portugal, Russia, and Greece contain among them about 30 universities. England has four—two ancient, Oxford and Cambridge; and two modern, London and Durham. Scotland has the four universities of St Andrews, Glasgow, Aberdeen, and Edinburgh; and Ireland has Trinity College, Dublin, and the three affiliated colleges of the Queen's University.

Of the universities of Germany, the oldest are Prague, founded in 1348, and Vienna, in 1365. Heidelberg dates from 1386; Leipzig, 1409; Tübingen, 1477; Jena, 1558; Halle, 1694; Göttingen, 1737; Berlin, 1810; and Bonn, 1818. The chief administrative body of the German universities is the Senatus Academicus, composed of the ordinary professors, presided over by a rector elected yearly, or (at Halle and Tübingen) by a chancellor appointed for life, the exercise of discipline being, however, intrusted to a separate court, presided over by a judicial officer called the Syndic. There is a recognised gradation in the professorial office. The highest class are *ordinary professors*, generally men of considerable eminence in their respective departments, elected by government out of three

candidates submitted by the faculty to which they belong. Next to them are the *extraordinary professors* of the same branches, with smaller salaries; and then the class of *privat-docents*, who, in the course of time, qualify themselves to be extraordinary professors. An ordinary professor must deliver public lectures on the branch to which he is appointed; an extraordinary professor, or privat-docent, may lecture on what subject he pleases. The student is for the most part at liberty to attend what lectures he pleases; but licenses to practise certain professions, benefices in the church, and other posts, are only given to persons who have gone through a certain course of university study. In addition to the above-mentioned classes of instruction, there are attached to the university teachers of modern languages and other branches not forming part of the curriculum. The *Bursæ*, foundations resembling in their origin the English colleges, and the *Convikt*, or free table, are institutions for the benefit of the poorer students, from the former of which is derived the name *bursche*, popularly applied to a student in Germany. The German university system is admirably adapted to promote the advancement of science; its deficiency is chiefly in appliances for superintending the progress of the individual student. The professor is often more an instructor of the world at large by his writings, than of his students by his lectures.

The two great English universities are little inferior in antiquity to Paris and Bologna. From the beginning of the 12th to the middle of the 14th c., Oxford played nearly as important a part in the advancement of science and political life as Paris itself, with which it was connected by intimate ties, the most eminent doctors of Oxford acting at the same time as regent-masters in Paris. It espoused the cause of the barons against the crown, and while preserving an intimate relation with the church, generally sided against ecclesiastical abuses. Oxford and Cambridge, not unlike the continental universities in their origin, developed themselves in a manner peculiar to England. From an early period, it was the practice of the students to live in common in halls or hostels, rented from the burghers, under the charge of a common teacher. In 1280, there were no fewer than 34 halls at Cambridge, some containing as many as 20 to 40 Masters of Arts, and a proportionate number of younger students. In the course of time, colleges were endowed by benevolent persons for the maintenance of the poorer students, and the name *socii*, or *fellows*, was applied to the recipients of the endowments. This assistance was originally meant to last no longer than the completion of the course of study; but as most of the *socii* belonged to the ecclesiastical order, and had no other means of support, an understanding gradually arose that the aid furnished by the college should be continued to the *socius* till he succeeded in obtaining a benefice. These provisions gradually increased in number and importance; and a practice was introduced of the colleges receiving wealthier students as boarders—the origin of the class of commoners or students not on the foundation. Most of the halls fell into decay, and those that remained received a collegiate character. In the 15th c., fellowships were no longer endowed to assist students going through their course of study, but as a permanent provision for poor young men of the clerical order who shewed a taste for learned pursuits, and the degree of Master was made a necessary condition for holding them. In this way, the colleges became the university; the university acquired a semi-monastic character, which has since more or less adhered to it; and a tutorial system of education within the colleges was almost entirely substituted for instructions by university professors. For two centuries, the staff of professors have had little to do with academical education or discipline. The instruction of the student is committed to college tutors, assisted by private tutors, and attendance on the professors is in general neither required for university rank nor for college emoluments. The tutorial system is defended on the ground of its giving the instructor a greater hold over the student's attention. On the other hand, it lacks the advantages arising out of the division of labour in the professorial system; and it is now generally allowed that a mixture of both systems of teaching is better than either alone. An effort has been made by the new statutes to render the professorial office in Oxford and Cambridge rather less of a sinecure than formerly. One of the most remarkable features of the English universities is their wealth in endowments. The fellowships and scholarships of Oxford, with the ecclesiastical benefices in her gift, amount to about £450,000 annually. For the mode of government, see CAMBRIDGE; OXFORD.

Of the two modern English universities, London University (q. v.) was established by royal charter in 1836. Durham University was opened for students in 1833, and obtained the right of conferring degrees by royal charter in 1837. The general provisions for education are similar to those of Oxford and Cambridge, and there is also a course of theological study. In 1837, a course of instruction was added in mining and civil engineering. The university of Dublin (q. v.), founded in 1591, consists of a single college, named Trinity, with a constitution similar to the colleges of Oxford and Cambridge; but the professorial element is to a large extent united with the tutorial.

The universities of Oxford and Cambridge have since 1603 returned two members each to the House of Commons, and the same privilege is enjoyed by the university of Dublin.

The universities of Scotland, mostly founded in the 15th c., approached much more nearly to the type of Germany and the Low Countries than of England. The teaching as well as governing body were the professors; and the college was a building for the accommodation, not of the students or fellows, but of the professors, as public lecturers. Though nearly all the students were Scotchmen, they were nevertheless divided, according to continental usage, into four nations, named from the parts of Scotland to which they belonged. In St Andrews, there were from the first the separate faculties of divinity, arts, and canon law. A pædagogium was erected in 1430 for the faculty of arts. In 1450, Kennedy, Bishop of St Andrews, established and endowed the college of St Salvator, to which Pope Paul II. accorded the privilege of conferring degrees in theology and the arts, constituting it to that effect a separate university. St Leonard's College was founded in 1512, and St Mary's in 1537, with power of conferring degrees. After the Reformation, St Mary's was restricted to the study of theology; and in 1747, St Salvator and St Leonard were united. Glasgow had its lecturers in canon and civil law, and theology, from the beginning. The faculty of arts, however, alone received a definite shape and constitution; it had, as at St Andrews, a pædagogium; and prior to the Reformation, had nearly absorbed the university. During the Reformation period, Glasgow University was nearly annihilated; but it was restored by the exertions of Queen Mary and James VI. 'The university of Aberdeen, as now constituted, derives its origin from two different foundations—one, the university

and King's College of Aberdeen, founded in 1494 by William Elphinstone, Bishop of Aberdeen, under the authority of a papal bull obtained at the instance of King James IV.; the other, Marischal College and University of Aberdeen, founded in 1593 by George Keith, Earl Marischal, by a charter ratified by act of parliament' (*Aberdeen University Calendar*). By the Universities (Scotland) Act, 1858, King's and Marischal College have been incorporated into one university and college, as the university of Aberdeen—King's College being reserved for the faculties of arts and divinity, and Marischal College for law and medicine. The university of Edinburgh, founded after the Reformation, had but little of the ancient university character, being a professorial seminary on a royal foundation, rather than a society of graduates or students. James VI.'s charter of foundation placed it in the hands of the magistrates of the city, who remained its patrons till 1858. Each of the Scottish universities has its bursaries or scholarships; most numerous at Aberdeen, and least so at St Andrews; but they are insignificant in amount compared with the similar endowments of the English universities.

The Scotch universities have been much modified in various respects by a statute passed in 1858. For some time previous, there had been a growing conviction that they were not keeping pace with the intelligence of the country. The absence of sufficient preparation on the part of the students obliged the professors of languages and mathematics to discharge inefficiently the functions of schoolmasters rather than their proper duties. Scholarship had declined, and a Scottish degree in arts had fallen into disrepute. These evils were sought to be cured by establishing an entrance examination, by grafting a certain amount of the tutorial on the professorial element, and by raising the standard of examination for degrees, so as to make them objects of ambition. The act of 1858 placed the Scottish universities under the superintendence of a Board of Commissioners for the space of four years, who had power to carry the statutory provisions into effect. A uniform constitution was given to all the universities, each of which has now three governing bodies, the Senatus Academicus, the University Court, and the General Council; the chief officers being the chancellor, the vice-chancellor, and the rector. The *Senatus Academicus*, composed of the principal and professors, superintends the teaching and discipline, and administers the property and revenues of the university, one-third being a quorum, and the deliberations being subject to the control of the University Court. The principal presides, and has both a deliberative and a casting vote. The *University Court* consists of the rector, the principal, and assessors named by the chancellor, rector, General Council, and Senatus Academicus (in Edinburgh, the Lord Provost, and an assessor elected by the town-council, are also members of the court). The rector is president, with a deliberative as well as a casting vote. The rector, and the assessor nominated by him, continue in office for three years; the other assessors for four years. The functions of this body include the reviewing of the decisions of the Senatus, the regulation of the internal arrangements of the university, in conjunction with the Senatus, the chancellor, and the University Court; and the exercise of patronage to the chairs whose patronage was formerly in the Senatus. The *General Council* consists of the chancellor, the members of the University Court, the professors, masters of arts, doctors of medicine who have attended four sessions, and all persons who, prior to August 1861, produced evidence of attendance for four complete sessions, two of them being in the faculty of arts. The Council meets twice a year, the chancellor, whom failing, the rector, or principal, or senior professor present presiding, with a deliberative and casting vote. The duties of the Council are not legislative, but only deliberative; it may entertain any question affecting the university, and make representations regarding them to the University Court. The chancellor is elected by the General Council, and holds office for life; he appoints a vice-chancellor, who may act for him in conferring degrees, which is his principal function. The rector is elected by the matriculated students, and holds office for three years. At Edinburgh, the patronage of those chairs which were in the gift of the town-council has been transferred to seven curators, three of them nominated by the University Court, and four by the town-council. Entrance examinations have been instituted in all the universities, and assistants appointed to several of the professors, with functions somewhat analogous to those of tutors in England. The degrees now conferred in the Scotch universities are Master of Arts, Bachelor of Divinity, Bachelor of Laws, Bachelor of Medicine, Master in Surgery, and Doctor of Medicine; besides Doctor of Divinity and Doctor of Laws, which are purely honorary. Edinburgh grants, in addition, the degrees of Bachelor of Science and Doctor of Science. The degree of Bachelor of Arts is not now given in any of the universities of Scotland.

See Savigny, *Geschichte des Römischen Rechts im Mittelalter;* Bulæus, *Historia Universitatis Parisiensis;* Crevier, *Histoire de l'Université de Paris,* Malden, *History of Universities and Academical Degrees;* Kirkpatrick, *Historically Received Conception of a University;* Huber, *History of English Universities;* Wood, *History and Antiquities of Oxford;* Dyer, *History of the University of Cambridge; Reports of Royal Commissions of Inquiry into the Universities of Scotland; Ordinances issued by the Commissioners under the Universities (Scotland) Act.*

UNIVERSITY COLLEGE, the oldest college in the university of Oxford, is said to have been founded as early as 872 by Alfred the Great. It was restored by William of Durham, rector of Wearmouth, who, at his death in 1249, left a sum of money to form a permanent endowment for a certain number of 'masters,' preference being given to those who were born nearest the city of Durham. Among the subsequent benefactors are found King Henry IV., who founded (1403) three fellowships, at the request of Bishop Skirlaw of Durham (who consequently is also ranked as a 'benefactor'); Henry Percy, Earl of Northumberland, who founded (1442) three fellowships; Sir Simon Bennet, Bart., who founded (1631) four fellowships and four scholarships; &c. In 1714, Dr John Radcliffe attached to this college two fellowships, tenable for ten years by Masters of Arts, who are required to travel abroad during five years. The present foundation consists of 1 master, 13 fellows, 17 scholars, several exhibitioners, and a Bible clerk. The patronage consists of 10 livings, situated in the counties of Dorset, Gloucester, Hants, Hertford, Huntingdon, Oxford, Somerset, Sussex, and York, of an aggregate annual value of £5032.

UNIVERSITY OF FRANCE. In France, since the Revolution, the word University has acquired a meaning widely different from that which it bears in other countries; the expression 'Université de France' being nearly equivalent to 'National system of education of France.' All the old universities of

the country having been swept away at the Revolution, education had fallen into abeyance. After various attempts at the establishment of primary, secondary, and central schools in the departments, the imperial government adopted a new system, by which the whole educational machinery of the country was centralised at Paris, and committed to a body called the University, with a Grand-master at its head, assisted by a council. The system has undergone various alterations in 1814, 1850, 1852, and 1854. The governing body, the Council of Public Instruction, is now presided over by the Minister of Public Instruction, who has come in place of the Grand-master. It has control over all educational institutions, from elementary schools upwards. The Academies, of which there are 27, serve the same purpose as the universities of other countries, each having a territory of two or more departments allotted to it. They contain faculties of literature, law, medicine, and Catholic and Protestant theology; all these faculties, however, not being organised in every Academy. The colleges and schools of primary instruction are, in their turn, placed under the direct jurisdiction of the Academies.

UNKIAR-SKELESSI, a small town on the Asiatic shore of the Bosporus, in the neighbourhood of Scutari, gives its name to a treaty concluded between Turkey and Russia, July 8, 1833. This treaty, which consisted of six articles, was one of mutual defensive alliance; but a separate and secret article was subjoined, by which the sultan, in place of the military or naval aid which, by the first article of the treaty, he was bound to furnish to Russia, agreed to close the Strait of the Dardanelles, allowing no foreign vessels of war to enter it under any pretext whatever. In consequence of this treaty, Russia landed 15,000 men at Scutari, and stopped the victorious career of Ibrahim Pasha (q. v.). The secret article was soon after divulged to Britain and France, both of whom regarded the treaty with dislike; and by the terms of that concluded at London, July 13, 1841, the stipulations of U. were annulled.

UNLEAVENED BREAD, USE OF, in the Eucharist, has long been a subject of controversy between the Latin Church on the one hand and the Greek and other oriental churches on the other; with the latter of whom the Reformed churches in later times have conformed in their practice of celebrating the Lord's Supper. The early history of the usage is very obscure; but the Western Church had certainly, from a very remote date, employed *Azyms*, or unleavened bread, in the consecration and distribution of the Eucharist; nor was this usage made a subject of controversy with the Latins by Photius, on occasion of the dispute between the churches, which arose during his patriarchate. In the later controversy, however, under Michael Cerularius (see GREEK CHURCH), the question of azyms became very prominent, and the diversity of practice still continues a subject of controversy between the Greeks and Latins. The principal argument alleged by the advocates of the use of leavened bread, is founded on the assumption that the Last Supper of Our Lord took place on the eve of the Passover, that is, on the 13th day of the month Nisan, on which day common bread, and not the azyms, must have been used; and on this and some other grounds, some writers, even among the Roman Catholics themselves, and especially the learned Jesuit Sirmond, have maintained that the Last Supper was actually celebrated in leavened bread. On the other hand, however, it is contended that the Last Supper, being held in the evening of that day, was, in the strictest sense, Our Lord's celebration of the Passover, and therefore (Exodus, xii. 8—20), that the bread can have been no other than azym, or unleavened. It must be added that all Roman Catholic writers, and the more learned among the Greeks, are agreed that the Eucharist may be *validly* consecrated whether the bread be leavened or unleavened.

UNNA, a small town of Prussia, in Westphalia, 19 miles north-west of Arnsberg. It was formerly fortified, was one of the Hanse Towns, and played a *rôle* in the history of the Femgerichte (q. v.). About a mile to the north are the famous salt-works of Königsborn, which yield 120,000 cwts. of salt annually. Pop. (1872) 6915, who are employed in weaving linen and hosiery, and in brewing and distilling.

UNST, the most northern of the Shetland Islands, in lat. 60° 45′ N., is 12 miles long, and 3½ miles in average breadth; area, 36 sq. m.; pop. (1861) 3042. The coast is much broken, and the headlands are rocky, mural, and lofty. There are 2000 acres under cultivation, and about as many in pasture. Valuable minerals abound, and chromate of iron is an article of commerce. The island contains numerous tumuli, a chain of Scandinavian dunes, and the ruins of upwards of 20 ancient chapels. Fishing and agriculture are the chief employments.

UNTERWALDEN, one of the Waldstädten, or Forest Cantons of Switzerland, forms part of the Hill Country which surrounds the Lake of Lucerne (see SWITZERLAND). It is 25 miles in length by 21 miles in breadth, and has an area of 297 sq. miles. In 1850, the pop. was 25,138; in 1870, it was 26,116. U. is bounded on the E., S., and W. by lofty hills, and subsidiary ridges divide it into two parallel valleys—both of which open on the north into the Lake of Lucerne. The eastern valley is drained by the Engelberger Aa, the western by the Sarner Aa. Great highways run up these valleys from the shores of the lake, and in several places communicate with each other; but they do not connect U. with surrounding cantons. The canton is chiefly pastoral. Some attempts have been made to cultivate the vine, but they have not proved successful. The language of the people is a Swiss-German dialect; their religion is Roman Catholic. U. is divided into two parts; not, however, corresponding with the two river basins of which it is formed. The forest of Kerns, or Kernwald, formed the line of separation between these two districts, which were separate so early as 1150. One is named the Obwald, or district above the Forest, and includes the whole of the western valley. The other is the Nidwald, which includes only the lower part of the eastern valley. Each division forms an independent republic, with its own administration. Both have a *landesgemeinde*, or parliament, composed of all the inhabitants 20 years of age, with the exception of a few *heimathlosen* (tramps); and each forms a half-canton, that is, a canton which returns one member to the Swiss Council of State. The landesgemeinde of each half-canton assembles in the open air late in the spring, when it passes new laws, pays off accounts, imposes taxes, and appoints the executry officers. The capital of the Nidwald is Stanz, remarkable for its fine church and statue of Winkelried. The capital of the Obwald is Sarnen. Each of these towns has a pop. of about 2000.

UPANISHAD is the name of those Sanscrit works belonging to the Vedic literature which contain the mystical doctrine of the Hindus on the nature of a supreme being, its relation to the human soul, and the process of creation (see INDIA, see *Religion*). The word (derived from the Sanscr-

prefixes *upa*, 'beneath,' or 'near,' and *ni*, 'in,' combined with the radical *sad*, 'sit') is explained by the great theologian *S'ankara* (q. v.), and others after him, as meaning the 'science of Brahman,' or 'the understanding of the identity of Brahman and the soul,' because 'in those devoted to it, this science *sets to rest* (or destroys) the world, together with (ignorance) its cause;' or, in other words, because it shews to them that the world has, besides Brahman, no reality. Grammatical commentators explain its etymology as implying that 'eternal bliss *reposes on it* (*upanishîdati s'reyo 'syâm*);' and Professor M. Müller has surmised that the word 'Upanishad meant originally the act of sitting down near a teacher, of submissively listening to him,' whence it came to mean 'implicit faith, and at last truth or divine revelation.' But apart from the artificialness of all these interpretations, it deserves notice that the earliest sense of the word appears to be that of 'secret' or 'mystery' (literally, 'that which *sits* or rests *beneath*'). In this sense, it is mentioned by the grammarian Pân'ini; and as it is very probable that, in his time, the works bearing the name of Upanishads were not yet in existence (see Goldstücker's *Pân'ini*, &c., p. 141), it may be assumed that these works derived their name from the mysteriousness of the doctrine contained in them; and perhaps also from the mystical manner in which they propounded it.

In order to understand the origin and purport of the Upanishads, as well as the relation in which they stand to the Vedas, properly so called, it must be borne in mind that, though the Vedic hymns are based on the worship of the elementary powers, and the Brâhman'a portion connected with them is chiefly concerned in legendary and ritual matter relating to that worship, yet in both these portions of the Vedas, and especially in the Brâhman'as, the beginnings of a period become already visible when the poets raised the questions as to the origin of the world and the true nature of the gods. See INDIA, sec. *Religion.* A first attempt at a systematic answer to these questions was made in works which bear an intimate relation to the Brâhman'as; and so great was the awe in which, on this account, these works were held, that they had to be read in the solitude, where the mind could ponder in perfect calmness over the mysterious problems in which they are engaged. These are the *Âran'yakas* (from *aran'ya*, a forest). But as the style and contents of the Âran'yakas are extremely obscure, and as, through the close alliance of these works to the Brâhman'as, of which some of them form part, the theological questions of which they treat are much overlaid with ritual and other matters which properly belong to the Brâhman'as, a further progress made in the same direction, led to the composition of works and treatises, the diction of which is somewhat clearer, and less entangled with subjects extraneous to the problems they intend to solve. Such works and treatises are the *Upanishads.* Their object, like that of the Âran'yakas, is to impress the mind with the belief in one Supreme Spirit (*Brahman*, as a neuter, and different, therefore, from the same word as a masculine, which is the name of the first god of the *Trimûrti*, q. v.), to shew that this Supreme Spirit is the creator of the world; that the world has no reality if thought of besides Brahman, and that the human soul is identical in nature with that same Spirit whence it emanates. The reward the Upanishads hold out to the believer, who understands their doctrine, and firmly adheres to it, is freedom from Transmigration (q. v.), and consequent eternal bliss. The object and aim of the Upanishads are therefore the same as those propounded in the philosophical systems (see SANSCRIT, sec. *Literature*); and the Upanishads may therefore be looked upon as the forerunners of these systems themselves — those Upanishads, at least, which we may call the older Upanishads; for as to the more recent ones, and those which bear the stamp of a sectarian character, their claim to be ranked among the Vedic writings is extremely doubtful, if at all admissible.

Though agreeing in the main points of their doctrine, it is easily understood that works of this nature, ranging over different periods of Hindu religion, will also differ from one another both in the manner and detail in which they deliver their subject-matter, and in the degree of completeness with which they treat of it. Thus, in some, the legendary narrative, and even ritual detail, are still considerably blended with the theosophical speculation—and these stand nearest, therefore, the Âran'yakas, probably also in time; in others, more philosophical, the nature of Brahman and the human soul is the only subject of inquiry; in others, the process of creation is also enlarged upon, with detail which harmonises more or less either with the ulterior views of the Vedânta (q. v.) or those of the Sânkhya (q. v.) philosophy; some Upanishads, again, especially emphasise the inefficiency, for the attainment of eternal bliss, of the performing religious acts and of worldly studies—the knowledge of Brahman being the only means that leads to this end; others, on the contrary, in conformity with the Yoga (q. v.) doctrine, assign a prominent place to the exterior means, by using which the soul would qualify itself for union with the Supreme Spirit; while the sectarian Upanishads, which identify this Spirit with Vishn'u and S'iva, have, besides, the tendency of reconciling the popular with the philosophical creed.

Of the older Upanishads, a typical instance is furnished in the Chhândogya Upanishad of the Sâmaveda, the framework of which is legendary throughout, and its contents allegorical and mystical. Other shorter Upanishads, freer from narratives and allusions to the mysterious import of ritual acts, aim at a more intelligible exposition of the doctrine of the soul. Of their mode of treatment, the following passage from the *Kât'haka* Upanishads will serve as an example: *Nachiketas*, the son of Vâjas'ravas, having come to the abode of Yama, the judge of the dead, and obtained from him the grant of three boons, asks of him, for his third boon, an answer to the following question: 'There is this doubt: some say that (the soul) exists after the death of a man (in connection with another body than this); others say that it does not. This I should like to know, instructed by thee.' And Yama, after some hesitation, explains to him that the soul and Brahman are one, but that a man attains immortality only by understanding this unity, and that, to arrive at this understanding, he must free his mind from sensual desires, and get a correct knowledge both of the nature of Brahman and of the soul. 'Know the soul as the rider, and the body as the car; know intellect as the charioteer, and *manas* (the organ of volition) as the rein. The senses, they say, are the horses, the objects (their) roads; and the enjoyer (i. e., the rider) is (the soul) endowed with body, senses, and manas. Thus say the wise. If he (the charioteer) is unwise, and his manas is always unbridled, his senses are uncontrolled like vicious horses; but if he is wise, and his manas is always bridled, his senses are controlled like good horses. He who, always impure, is unwise, and whose manas is unbridled, does not attain *that* abode (of immortality), but comes to the world (of birth and death); he, however, who, always pure, is wise, and whose manas is bridled, he attains *that*

abode whence he is not born again. The man who has a wise charioteer, and whose manas is bridled, reaches the other shore of the road (of the world), the highest abode of Vishn'u. Higher (i. e., subtler), indeed, than the objects are the senses; higher than the senses is manas; higher than manas, intellect; and higher than intellect, the great one, the soul. Higher than the great one is that which is unmanifested, and higher than the unmanifested is Purusha, the supreme spirit. But higher than Purusha there is nothing; he is the goal, the highest resort. This highest spirit is the soul hidden in all created beings; it is not manifest, but is beheld by those who can see what is subtle with an attentive, subtle intellect.' The coincidence between the allegory, in the foregoing passage, and that in Plato's *Phædrus*, imparts an additional interest to this Upanishad, which is valuable, moreover, on account of the evidence it affords as to points of agreement and difference between its views of the development of the world and those expounded in the Sânkhya (q. v.). The *Mun'daka* Upanishad is important for the relative position which it assigns to the teaching of the Vedas, and the doctrine of the Upanishads. 'Two sciences,' it says, the knowers of Brahman tell us, 'must be known, the higher and the inferior. The inferior is (the knowledge of) the R'igveda, the Yajurveda, the Sâmaveda, and the Atharvaveda, the knowledge of pronunciation, the ritual, grammar, explanation of Vedic texts, prosody, and astronomy. But the higher knowledge is that by which that imperishable Brahman is comprehended. That which is invisible, unseizable, without descent (or origin), without either colour, eye, or ear, without hand or foot, eternal, manifold (in creation), all-pervading, very subtle, undecaying—the wise behold it as the cause of created beings.' And in another place, the performers of the sacrificial rites ordained by the Veda are said to attain, indeed, to Indra's heaven in virtue of their pious work; but this state of bliss is declared to be unstable and perishable, and these 'fools . . . . drop (from their heaven) as soon as this heaven (the reward of their acts) has faded away. Fancying that pious acts, ordained by the Vedas and codes of law, are the highest (object of man), these ignorant people do not know that there is something else which leads to eternal bliss. Having enjoyed (the reward of their deeds) on the happy summit of paradise, they enter again this world, or one that is (even) lower. Those, on the contrary, who practise penance and faith, and, with subdued desire, live in the forest, under the vow of a religious mendicant, they, free from sin, enter through the sun to that abode where resides that immortal spirit, that spirit, indeed, of undecaying nature.'

The *Talavakâra*, or *Kena*, Upanishad, which, being one of the shortest, is in form one of the most philosophical treatises of this kind, puts in clearer language, perhaps, than any other Upanishad, the doctrine that the true knowledge of the supreme spirit consists in the consciousness which man acquires of his *incapacity* to understand it, since the human mind being capable only to comprehend finite objects, cannot have a knowledge of what is infinite.

The Upanishads are not supposed to have been revealed in the same manner as the Vedic hymns. See VEDA. Nevertheless, with the exception of a few confessedly modern Upanishads, they are not assigned to human authorship, but looked upon as inspired writings, to which the term *S'ruti* (q. v.) applies. In several Upanishads, no special mention is made of their divine origin; in some, however, this is done. Thus the *Chhândogya* Upanishad, in its concluding section, relates: 'This (knowledge of the soul) Brahman (the god of the Trimûrti) imparted to Prajâpati (a lord of creation—the patriarch Kas'yapa, as S'ankara explains); Prajâpati imparted it to Manu, and Manu to mankind;' the *Br'ihadâranyaka* Upanishad, which on three occasions gives long lists of teachers who handed it down to their pupils, always ascribes itself, in the last instance, to the authorship of 'the self-existent Brahman (the supreme spirit);' and in a similar manner the *Mun'd'aka* Upanishad says that it was Brahman (the god of the Trimûrti), the creator of the universe, who first taught the science of the supreme spirit to his eldest son, Atharvan. As in the case of most ancient works of Sanscrit literature, the date of the Upanishads also still remains quite uncertain, and, wherever given, is purely conjectural. According to the native system, they are classified as belonging to one or the other of the four Vedas, with which they are held to stand in immediate connection. There are Upanishads, consequently, of the R'ig-, Yajur-, Sâma-, and Atharvaveda. But this classification has no reference whatever to chronology.—For a fuller account of these works, see Professor Weber's *Indische Studien*, vols. i. ii. (Berlin, 1850—1853), and his *Akademische Vorlesungen über Indische Literaturgeschichte* (Berlin, 1852); Professor M. Müller's *History of Ancient Sanskrit Literature* (Lond. 1860); John Muir's *Original Sanskrit Texts*, vol. i.—iv. (Lond. 1858—1863); and the edition and translation of several of these Upanishads by E. Roer, *Râjendra Lâla Mitra*, and E. B. Cowell, in the *Bibliotheca Indica;* also Raja Rammohun Roy's *Translation of several Principal Books, Passages, and Texts of the Veds* (Lond. 1832). The names of 149 Upanishads, as compiled from various sources by Professor M. Müller, may be found in the *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, vol. xix. p. 137, ff.

UPAPURÂN'A. See PURÂN'A.

U'PAS (the Malay word for *poison*) is the name given to a number of vegetable poisons in the Eastern Archipelago and the Philippine Islands. The most celebrated poison of this kind is produced by the *Antjar* (*Antiaris toxicaria*), a tree which grows in

Antjar (*Antiaris toxicaria*).

the Sunda and Philippine Islands. It attains a height of upwards of 100 feet, and belongs to the natural order ARTOCARPACEÆ (q. v.), the same order

with the bread-fruit. The leaves are lanceolate. The female flowers are solitary; the male flowers congregated beneath them in numbers upon the receptacle, which has a long stalk, and is of the shape of a watch-glass. The fruit is a kind of drupe, covered with fleshy scales. From the milky juice of this tree (called in some of the islands *Pohon-Upas*, *Antjar* in Java, and *Ipo* in the Philippines), mixed with black pepper, and the juice of galanga root and of ginger, the Malays prepare a poison for their arrows, which proves speedily fatal to men and to the larger mammalia. The only hope of relief is by means of severe vomitings and the excitement of profuse perspiration. Although the fresh juice of this tree, brought into contact with the skin, acts as a poison, the story of a poison-vale in Java, in which the exhalations of numerous poison-trees extinguish all animal life, and even all other vegetable life, is a mere fable. There is a narrow valley in Java where neither animal nor vegetable life can subsist; but this is owing to carbonic acid gas emitted from the ground, as in the *Grotto del Cane*, near Naples, and the upas-tree is as incapable of living there as any other. It is found in forests, and does no harm to the other trees around it. The prepared upas or antjar poison is kept in closed tubes of bamboo, and is of the consistence of molasses. The flesh of animals killed by this poison may be eaten with perfect safety; although the virulence of the poison is shewn by its extremely rapid action. It is not perfectly known what the substance is which gives to the juice of the upas tree its poisonous properties, but it appears to be an alkaloid. The fibre of the bark of the upas tree is sometimes made into cloth, but unless the fibre is thoroughly cleaned, garments made of it produce a painful itching.—A still more powerful poison than the upas antjar, employed in the same part of the world, is the *Upas Tjettek*, or *Upas Tieute*, which is prepared in a similar manner from the root of the *Strychnos tieute* (see STRYCHNOS). It abounds in strychnine.

UPHEA'VAL or UPTHROW OF STRATA, the change in stratified rocks from their original horizontal position to one more or less inclined, produced by an expansive subterranean force, or other power, like the pushing forward of the crust itself, as in the case of the Appalachian Mountains (q. v.). In slight changes of level, the continuity of the rock is unbroken; but frequently, immense cracks are formed, into which igneous rocks penetrate, and form a back-bone for the upraised mass, or dykes penetrating the strata. Upheavals may take place slowly, like the present gradual change in the Scandinavian coast, or may be more rapid when produced by some sudden earthquake.

UPHO'LSTERY, that branch of trade which relates to the furnishing of a house with curtains and other kinds of hangings. It is also applied more generally, and is made to include bedding, carpeting, and the covering of chairs, couches, &c.

UPOLU', one of the richest and most beautiful of the islands of the Pacific, belongs to the Samoan group, lying about 60 miles west of Tutuila. It is 140 miles in circumference, and has 16,000 inhabitants. The island has been a mission-station for many years, and the English consul is (1866) the son of Mr John Williams, the missionary, whose melancholy fate is well known. Many of the inhabitants are Christians. The chief harbour is Apia, a civilised-looking place, with many edifices on the European model. The principal trading establishment is that of the Hamburg consul, who, in 1862, exported 700 tons of cocoa-nut oil. Many of the natives are turning their attention to the cultivation of cotton, and the cotton-seed grows wherever it is cast on the ground; the only trouble experienced in raising cotton is the clearing and keeping down the weeds. In the year 1866, 200 acres were under this crop. The principal article of export, however, is cocoa-nut oil. In 1864, 91 vessels, of 10,291 tons, entered and cleared the port.

UPSA'LA, an ancient and beautiful town of Sweden, on the Fyrisä, a navigable stream, 45 miles north-north-west of Stockholm. The eastern part of the town stands on a wide and fertile plain; the west part, containing the chief buildings, occupies a high range of ground looking over an apparently boundless plain to the north and east. U. is the seat of an archbishop, who is the primate of the whole country. The great attraction is the cathedral, once a beautiful structure, and handsome still, though disfigured by restorations. It is in the Gothic style, built of brick, was founded in 1258, and completed 1435; is 330 feet long by 140 broad, and 105 feet high; and contains the tombs of Linnæus, and of Gustavus Vasa and several other Swedish kings. The university of U.—the chief institution of the kind in the country—was founded in 1477, and is attended by about 900 students, taught by 47 professors. The library contains 135,000 vols. and 7000 MSS., several of which are very valuable. Population, 20,000. the mass of whom are dependent upon the university for their livelihood. —Two miles north of the town is Old Upsala, now a village, which, during the heathen period, was the seat of the Odin worship, with a splendid temple and sacred grove, which have now disappeared. Also, about four miles from U. are the famous Mora-stones, where in the middle ages the election and crowning of the Swedish kings took place.

U'RACHUS, THE, in the adult human subject, is a small fibrous cord formed by the obliteration of a tubular canal, which in the embryo runs from the apex of the bladder to the umbilical cord. In other mammals, it remains open, and is continuous with one of the fœtal membranes; and it has been found pervious in the human subject at birth.

U'RAL, a river of Russia, called *Rimna* by the ancients, later, *Jaik*, and since 1775, by its present name, rises in the southern section of the Ural Mountains, near the east frontier of the government of Orenburg. It flows south through the district of Troitzk, past the town of Virchni-Uralsk, to its confluence with the Kisil; and in this region its course is over hilly meadows, and its current is very rapid, owing to its narrow and uneven bed. At the town of Orsk the river bends westward, and runs in that direction as far as the mouth of the river Tchagan, after which it flows directly south, and falls into the Caspian Sea. It is deep enough for navigation; but owing to the scarcity of wood for ship-building, and the number of sandbanks that bar the river, no navigation can be carried on. This loss, however, is compensated by the fisheries of the river, which abounds in the most highly esteemed varieties of fish, and yields to the Cossacks settled along its banks an annual revenue of 600,000 rubles (£93,750). The U. has long served as the frontier separating Russia from the Kirghis Steppes, and many forts have been erected, and a settlement of Cossacks—known as the Ural Cossacks—established along the river. The direct length of the U. is estimated at 550 miles; with windings, 1040 miles. The principal affluents are the Kisil and Sakmara on the right, and the Or and Ilek on the left.

URAL MOUNTAINS (probably the Tartar word *ural*, belt), the *Hyperborean Mountains*, or *Rhipæi Montes*, of the ancients, form part of the

boundary between Europe and Asia, and separate European Russia on the west from Siberia on the east. The chain extends south from the Kara Sea, an arm of the Arctic Ocean, to the middle course of the Ural river, or from lat. 70° to that of 50° N., and is 1333 miles in length, with a breadth varying from 16 to 66 miles. Although the U. M. form really a single uninterrupted chain, geographers have agreed to consider them as divided into three sections—the Northern, Middle, and Southern Ural. The Northern Ural separates the basins of the rivers Petchora and Ob, is for the most part rocky, does not rise higher than 3000 feet, and is commonly called *Poustoi* (empty), because it is extremely poor in ore. The Middle Ural, commonly called *Roudnoi* (metalliferous), the principal seat of the mineral riches of the whole chain, comprises the highest peaks, as the Kanjakovski Kamen, rising to 5000 feet; but in some places, the height is so insignificant, and the slope so gentle, that travellers can scarcely distinguish it from the lowlands. The Southern Ural divides itself into three branches, two of which extend to the east of the Ural river, and gradually disappear in the Uralo-Caspian deserts, while the third branch extends along the right—the western—bank of the Ural. The chain is composed chiefly of crystalline and metamorphic rocks, granite, gneiss, porphyry, chloritic, and micaceous schists. The U. M., especially the middle and the north part of the Southern Ural (the governments of Perm and Orenburg), abound in mines of gold, platinum, copper, and iron. These mines, or *zavods*, are partly the property of the state, partly that of private individuals. Of the latter, the chief are the Nijni-Tagilsk, belonging to the Demidoff family; the Verchisetsk and Neviansk, belonging to the Takosleff family. The gold diggings occur on the eastern slopes of the mountains, and gold is sometimes found in nuggets of considerable weight—the heaviest ever found in the chain being about 80 English lbs. in weight. In 1862, the amount of gold extracted from the U. M. was 185 poods 57 lbs. (6660 English lbs.). The platinum found is chiefly obtained from the Nijni-Tagilsk mines, and the amount obtained was 148 poods (5328 English lbs.). The richest copper ores in the U. M. are malachite and azurite; but the metal is extracted also from pyrites. The total amount found in 1862 was 248,865 poods (8,959,140 English lbs.). The amount of iron extracted in 1862 was 4,365,348 cwts., of which 2,778,400 cwts. were made into steel. The destruction of the forests has made the extraction of coal indispensable; but till 1866 the yearly amount was only 143,763 cwts., and none is exported. Among precious stones, the most notable are the emerald, found on the eastern slope in the district of Ekaterinburg, and some of which weigh 13 dwts. 9 grs. Other precious stones are found, as the beryl, topaz, amethyst, and diamond, the last discovered in accordance with the prediction of Humboldt, but of small value. Malachite and jasper also occur. The pop. inhabiting the U. M. and supported by the mines, is 135,000 inhabitants.

URA'LSK, a Russian town, belonging to the territory of the Ural Cossacks, and included within the governorship of Orenburg, stands on the right bank of the Ural, 150 miles south-south-east of Samara. It was founded in 1622 by the Ural Cossacks, and was till 1775 known under the name of Jaitsk. A good trade is carried on—the principal articles being fish, isinglass, caviare, tallow, and cattle. There are three great yearly fairs—in July, October, and January. Pop. 5000.

URA'NIA (i. e., 'the Heavenly Muse') was a daughter of Zeus and Mnemosyne. She was regarded as the Muse of Astronomy, and was represented with a celestial globe, to which she points with a little staff.


Urania.

URA'NIUM (symbol U, equiv. 120, sp. gr. 18·4) is a very hard, but moderately malleable metal, resembling nickel or iron in its lustre and colour; but in a finely comminuted state, occurring as a black powder. It is not oxidised by exposure to air or water at ordinary temperatures; but if heated in the air, it burns brilliantly, and is converted into oxide. It is a comparatively rare metal, which never occurs native; its sources being *Pitch-blende*, which contains nearly 80 per cent. of black oxide; *Uranite*, which contains a hydrated double phosphate of lime and uranium; and *Chalcolite*, which is a similar phosphate of copper and uranium. U. forms at least four oxides, viz., two principal ones—an *uranous oxide*, UO, and an *uranic oxide*, U_2O_3; and two intermediate oxides—the *black oxide*, U_4O_5, and the *green oxide*, U_3O_4. For the methods of preparing these oxides, the reader may consult any of the larger chemical text-books. The black oxide is of much value as a pigment for colouring porcelain; and compounds of the sesquioxide (or peroxide) with the earths are employed to communicate a peculiar yellow tint to glass. The salts of the protoxide have a green, and those of the peroxide a yellow colour. None of them are of any special importance. The metal is extracted from pitch-blende; and its isolation in a pure form is due to Peligot in 1841; Klaproth's supposed metal (which he discovered in 1789) turning out to be the protoxide. The metal was not obtained in the compact form till 1856.

URBAN, the name of eight popes, of whom the following deserve to be specially noticed. —URBAN II., a Frenchman by birth, and originally a monk of Clugny, was elected in a council held at Terracina, in the year 1088, during the schismatical pontificate of the anti-pope Guibert, styled Clement III. U.'s name was Otho, and he had been Bishop of Ostia. Soon after his election, he resumed possession of Rome, the fortresses of which had been occupied by the anti-pope, whom he compelled to withdraw. Guibert, nevertheless, was still supported by his patron, Henry IV. of Germany, who had long been at feud with the papal see; and U., in concert with the celebrated Countess Matilda, having formed a strong party in Italy, Henry once more led an army thither, and excited in Rome against the pope a party, whom he induced to recall Guibert—U. establishing himself at Anagni. The revolt of Conrad, the eldest son of Henry, against his father, and his coronation as emperor at Milan in 1093, and still more the successful appeal of Henry's queen, Adelaide, turned the tide of affairs in Italy. A great council was held at Piacenza in 1095, in which the anti-pope and his adherents were excommunicated. In the same council, the Crusade was proclaimed; and in the following autumn, U., in a council held at Clermont, made the well-known appeal on the same subject, which called forth that enthusiasm which was destined to lead to the long series of efforts for the recovery of the Holy Land, which forms so striking a characteristic of medieval history. In his later pontificate

U. pursued the same course, and in the end, succeeded in driving Henry IV. out of Italy The most important event of the last years of his pontificate was the holding of a council at Bari in 1098, in which many Greek bishops were present, and in which the addition of the words *filioque* to the Creed was discussed. Thence he returned to Rome, of which he obtained full and undisturbed possession; and he died in the close of 1099, just at the time when the first Crusade which he had organised terminated in the successful occupation of Jerusalem.—URBAN V. (originally William de Grimoard) is remarkable as practically the last of the popes who resided at Avignon, and the one by whom the papal seat was for a time re-transferred to Rome. He was a native of France, and had been Abbot of St Victor at Marseille. On the death of Innocent VI. in 1362, he was elected at Avignon, where he continued to reside, sending his legate, Cardinal Gil de Albornoz, to reduce the rebellious subjects of the papal see in Rome. After various alternations of peace and contest, U. took the resolve of returning in person to the ancient seat of the papacy. He set out in 1367; and landing at Corneto, proceeded first to Viterbo, and in the end to Rome, which he reached in October 1367. He found the papal city in a condition all but ruinous, and the whole of Italy overrun by bands of mercenaries, and a prey to intestine divisions of the worst character. He endeavoured, in concert with the queen of Naples, Joanna, in the following year, and of the Emperor Charles IV., to repress these disorders, but with little success; and in 1370, he resolved once again to repeat the experiment of a withdrawal of the papal residence from Rome. He set out in September of that year; but only outlived his return to Avignon by a few weeks, and died in December 1370, leaving the reputation of great personal piety, disinterestedness, and zeal for the interests of religion and morality.—URBAN VI. deserves a special notice, as being the pope under whom the great Western Schism had its origin. His name was Bartolomeo Prignano, and at the time of his election he was Archbishop of Bari. On the death of Gregory XI. (1378), who had finally returned from Avignon to Rome, and died in that city, Prignano was elected in a conclave held at Rome under circumstances of great excitement, owing to the apprehension, on the part of the populace, of an intention to elect a French pope, and again abandon Rome. The cardinals in the conclave numbered 16, of whom 12 were French, and 4 Italians. Prignano, although not a cardinal, was elected, April 8, 1378; and after the election had been made, the populace having broken into the hall, the cardinals dispersed; on the following day, however, they returned, confirmed the election, Prignano assuming the title of Urban VI., under which name he was crowned, April 18, in the presence of the 16 cardinals. In July of the same year, the 12 French cardinals assembled at Anagni, and revoked the election of U., in which they declared that they had been acting under the fear of violence. To this course they are said to have been led by the rigour and the intemperate severity with which U. was proceeding in the reforms of discipline, and especially of the simony and the irregular life of the clergy, including the cardinals themselves. They were joined by three of the Italian cardinals (one of them having died). On the 20th September, they proceeded to elect the cardinal bishop of Cambray (born Count of Geneva) pope, under the name of Clement VII. Clement took up his residence at Avignon. U., on the contrary, remained at Rome, where he appointed 26 new cardinals, and excommunicated Clement and his adherents. This conflict of claims was the origin of the WESTERN SCHISM (q. v.). U. was recognised as the lawful pope by one portion of the West, Clement by the other, and each maintained his claim by measures of the most extreme character. U. especially, although his title seems to have been best founded, weakened his cause by his excessive violence. Having engaged in a dispute with Charles, king of Naples, whom he had himself crowned, he was besieged by that prince at Novara, whence he withdrew to Genoa, taking with him, as prisoners, the cardinals of his party with whom he had quarrelled, and several of whom he is said to have put to death. In 1389, while he was on his way to Ferentino, he fell from his horse, and having been conveyed to Rome, died from the injuries thus sustained in October of that year. —URBAN VIII. was the successor of Gregory XV. His family name was Maffeo Barberini. He was born at Florence in 1568; and after a long series of brilliant services, both in the domestic administration and in foreign nunciatures, he was elected pope in September 1623. In the difficult position of Roman affairs, as complicated between France, Austria, and Spain, in the war of the Valtellina, to which he succeeded on his first election, he acquitted himself with much dexterity. His pontificate was also signalised by the acquisition to the Holy See of the duchy of Urbino (q. v.) in 1626. U. died in 1644. His memory has suffered through the imputation of nepotism; but his administration was, on the whole, vigorous and enlightened. He was the founder of the celebrated college of the Propaganda, and to him Rome is indebted for many public works, including large and important additions to the Vatican Library. Some of the early stages of the Jansenist controversy (q. v.) fall within this pontificate.

URBI ET ORBI (Lat. to the city and the world), a form used in the publication of papal bulls, for the purpose of signifying their formal promulgation to the entire Catholic world, as well as to the city of Rome. By the canon law, one of the conditions required in order that any new law shall be held to have force is 'promulgation;' but a very celebrated controversy arose in the 17th c. as to the kind of promulgation which should be regarded as sufficient. In ancient times, the practice of the popes had been to send copies of their bulls to the primates, metropolitans, and other ecclesiastical heads of the several churches, to be by them communicated to their suffragan bishops; but in progress of time, the practice of publicly proclaiming or of posting up the decree in the Campo dei Fiori in Rome was substituted for this transmission; and decrees addressed URBI ET ORBI, and published in this way, were held to be thus sufficiently promulgated to the various churches, and to be thenceforth of full force. The French jurists of the 17th c. strenuously controverted this view. The controversy is of little importance, even in the Roman Catholic Church, in these days of universal publicity and of rapid and simultaneous diffusion of intelligence.

URBINO, in Central Italy, capital of the province of Urbino and Pesaro, situated 20 miles south-west of Pesaro, and between the rivers Metauro and Foglia. Its walls date from the 14th c.; it has a magnificent palace, once the residence of the Dukes of Urbino, where was the famous library of the Della Rovere family, afterwards removed to the Vatican. Another handsome palace is that of the Albini, belonging to an Albanian family escaped from the ferocity of the Turks, and subsequently settled in U., where they became rich and powerful, and gave a pope to the church, who took the name of Clement XI. U. is an archiepiscopal see. Its

manufactures are unimportant, except a pin-factory. It is the birthplace of Raphael. Pop. 15,444. U. was a *municipium* under the Romans, and during the middle ages became the seat of a race of independent dukes, who existed up to 1626, when, on the death of Francesco, the last duke, Urban VIII. took possession of the duchy as a vacant fief; and it continued to form part of the papal states till 1860, when it became part of the kingdom of Italy.

U'RCHIN, SEA. See ECHINIDÆ.

URE, ANDREW, M.D., a distinguished chemist, was born at Glasgow in 1778, educated at Glasgow University, subsequently prosecuted his medical studies at Edinburgh, and returned to Glasgow, where he received the degree of M.D. in 1801. In 1802, he became Professor of Chemistry and Natural Philosophy in the Andersonian Institution (q. v.), took an active part in the establishment (1809) of an observatory at Glasgow, and was appointed its first astronomer. In 1813, he made his appearance in the literary world as the author of a *Systematic Table of the Materia Medica*, which was followed in 1818 by *New Experimental Researches on some of the Leading Doctrines of Caloric*, a memoir which, read before the Royal Society, and printed in the *Philosophical Transactions*, brought U. prominently into notice as a natural philosopher. Several papers on chemical subjects, the fruits of his accurate and extensive researches, followed. In 1821, appeared his *Dictionary of Chemistry;* in 1822, a paper *On the Ultimate Analysis of Animal and Vegetable Substances*, one of the earliest contributions to organic analysis, and a translation of Berthollet on *Dyeing;* and in 1829, a *System of Geology*, in which the hypothesis of a general Flood was maintained. In 1830, U. removed to London, and in 1834 was appointed analytical chemist to the Board of Customs. The products of his pen from this time assume more of a technological character, as the *Philosophy of Manufactures* (1835), *The Cotton Manufacture of Great Britain compared with that of other Countries* (1836), and *Dictionary of Arts, Manufactures, and Mines* (1839). A second edition of this last work was published in 1853, and a revised and enlarged one in America in 1863. U. was chosen a Fellow of the Royal Society in 1822, as well as of the Geological, Astronomical, and other societies at home and abroad. He died in London, 2d January, 1857.

URE'A (COH_4N_2) is an organic matter which derives its name from its having been originally discovered in the urine, of which it forms the most important and characteristic ingredient. It was until recently regarded as an organic base or alkaloid; but during the last few years it has been placed amongst the *amides*, a group of neutral, and for the most part crystallisable compounds, of the *ammonia type* (see TYPES, CHEMICAL), in which one of the three equivalents of hydrogen is replaced by the radical of an organic acid. For example, if R represent the radical, $\left.\begin{matrix}R\\H\\H\end{matrix}\right\}N$ represents the corresponding amide; and the character of the type is not affected by doubling the entire number of molecules, or changing it into $\left.\begin{matrix}R_2\\H_2\\H_2\end{matrix}\right\}N_2$. Now, if in this formula we substitute CO (carbonic oxide, or carbonyl, as it is now often termed) for R_2, we obtain $\left.\begin{matrix}CO\\H_2\\H_2\end{matrix}\right\}N_2$, which is identical with COH_4N_2, and possesses the advantage of showing the probable grouping of the elements in urea. Pure urea, which has been allowed to crystallise slowly, occurs in white, glistening, streaked, four-sided prisms; but when the crystallisation is rapid or disturbed, it separates in small white silky needles. It is devoid of smell, has a coolish bitter taste, like that of saltpetre (which it closely resembles in its external form), and is very slightly deliquescent. It is readily soluble in water and alcohol, but only slightly in ether. When heated to about 248°, it fuses, evolves ammonia, and becomes completely decomposed. A solution of pure urea in distilled water may be kept for a long time, and may even be boiled without undergoing decomposition; but if heated in a closed tube to about 284°, each equivalent combines with four of water, and is converted into carbonic anhydride and ammonia, according to the formula.

$$\overbrace{COH_4N_2}^{\text{Urea.}} + \overbrace{H_2O}^{\text{Water.}} = \overbrace{CO_2}^{\text{Carb. Anhyd.}} + \overbrace{2NH_3}^{\text{Ammonia.}}$$

A similar change takes place slowly at ordinary temperatures in the urea contained in the urine, the mucus of the bladder acting as a ferment, and thus rendering urine ammoniacal after it has been kept for a few days.

The following are some of the most important of the compounds of urea. *Nitrate of urea* ($COH_4N_2.HNO_3$) and *oxalate of urea* ($2COH_4N_2.C_2O_4H_2$) are readily crystallisable salts, formed by the direct addition of the respective acids to a moderately strong solution of urea. As nitrate of urea requires eight parts of cold water, and is still more insoluble if an excess of free nitric acid is present, and the oxalate is more insoluble than the nitrate, while urea dissolves in its own weight of water, these salts may be employed to test for, and approximately determine, the quantity of urea. Amongst the compounds of urea with metallic oxides, those which it forms with the oxides of mercury are especially interesting, and have been completely examined by Liebig. A result of his researches is his celebrated method, which is now in universal use, for determining the amount of urea volumetrically.

Urea occurs as the main and characteristic ingredient of the urine of man and mammals, being most abundant in that of carnivorous, and least so in that of vegetable feeders. The average quantity excreted by the human subject is mentioned in the article URINE. It is also a constituent of the fluids of the eye, of the sweat, and (in minute quantity) of the blood, and of the liquor amnii (of the fœtus). There can be no doubt that it is a final product of the regressive metamorphosis of the living tissues, or of their disintegration into simpler compounds, by means of which the final elimination of the worn-out structures is facilitated. Thus, we find that urea may be obtained by oxidising agents from uric acid, creatin, allantoin, &c., in the laboratory, and there is every reason to suppose that similar changes may occur in the system. Whether, when an excess of food is taken, a portion of it may be formed in the blood into urea, and then at once separated without ever having entered into the structure of the higher tissues, is a point which is scarcely decided.

Until the discovery by Liebig and Wöhler of the artificial formation of urea, its only source was the urine, from which, after evaporation, the nitrate was separated, purified by animal charcoal, and the urea liberated by the addition of carbonate of baryta, and finally extracted by alcohol, from which it was allowed to crystallise. It is now known that there are many different ways of forming it, as (1) by the action of oxychloride of carbon or phosgene gas $(Co)_2Cl_2$ on dry ammonia; or (2) by heating a mixture of carbonic ether $(2(C_2H_5)CO_3)$ and an alcoholic solution of ammonia to about 356° in a closed tube (both of which shew that urea exhibits some of the

properties of an *amide;* but the best practical method is essentially the original one of mixing watery solutions of cyanate of potassium and sulphate of ammonium, and evaporating the solution, which leaves a residue consisting of urea and sulphate of potassium, the former of which may be extracted by alcohol.

URE'AS, THE COMPOUND, include a large class of singular organic bodies, for the knowledge of which chemistry is mainly indebted to Professor Hofmann. Compounds of this kind are most readily formed by the action of cyanic acid on the amide or amidogen bases of the alcohol radicals, such as methylamine, ethylamine, &c. (the methylia, &c., of Miller and other chemists), instead of on ammonias. Thus, while ordinary urea is formed by the action of this acid on ammonia, methyl-urea, ethyl-urea, &c., are formed by its action on methylamine, ethylamine, &c., as shewn in the following formula:

$$\underbrace{H_3N}_{\text{Ammonia.}} + \underbrace{HNCO}_{\text{Cyanic Acid.}} = \underbrace{COH_4N_2}_{\text{Urea.}}$$

$$\underbrace{CH_5N}_{\text{Methylamine.}} + \underbrace{HNCO}_{\text{Cyanic Acid.}} = \underbrace{C_2H_7N_3}_{\text{Methyl-urea.}}$$

$$\underbrace{C_2H_7N}_{\text{Ethylamine.}} + \underbrace{HNCO}_{\text{Cyanic Acid.}} = \underbrace{C_3H_8N_2O}_{\text{Ethyl-urea.}}$$

These are the simplest forms of these compounds; amongst the more complicated ones are ethyl-methyl-urea, $C_4H_{10}N_2O$, phenyl-ethyl-urea, $C_9H_{12}N_2O$, &c. All these compound ureas combine like ordinary urea with acids, and form crystallisable salts.

URE'DO, a genus of minute parasitic fungi, of the order *Coniomycetes.* The original genus U. has been divided into many genera, forming a group called *Uredineæ,* which contains a multitude of species, parasitic on phanerogamous plants of almost every natural order, and in all parts of the world, at the equator and at the extreme limits of arctic and antarctic vegetation. Different plants have their own peculiar parasites of this kind, or the same *Uredineæ* are at least confined to plants nearly allied. A few species occur on ferns, but not very frequently. Every external part of plants, except the roots, is liable to be infested with these fungi, and some of them attack the inner tissues, their spores at length breaking through the outer strata of cells. Submerged parts of plants are never affected by them, for fungi dislike water; but the floating portions of aquatic plants are not exempt; and in all cases a moist atmosphere seems to be favourable to their development. Rank luxuriance of growth is often attended by their appearance. A plant once attacked is afterwards subject, if perennial, to the same parasite, even if removed to another situation. There is reason to believe, from experiments made by Fée, that the spores of the *Uredineæ* are taken up by the roots of plants from the soil, and find their way with the sap to the place proper for their growth. See BRAND, BUNT, MILDEW, RUST, and SMUT.

URE'NA, a genus of herbaceous plants of the natural order *Malvaceæ.* The bark is very fibrous; and the fibre of *U. lobata* and *U. sinuata,* weeds common in most parts of India, is used as a substitute for flax. It is strong, and tolerably fine.

U'RETERS (Gr. *ouron,* urine, and *tērein,* to keep), the canals by which the urine is conveyed from the pelvis of the kidney (see KIDNEYS) on either side to the base of the bladder. Each ureter is about eighteen inches in length, and enters the bladder in so slanting a direction as to prevent regurgitation.

When a concretion is formed in the kidney, the ordinary and most favourable event is that it should descend through the ureter to the bladder. The passage of a stone through this tube gives rise to a series of violent symptoms, which are thus summed up by Druitt: 'The patient complains of sudden and most severe pain, first in the loins and groin, subsequently in the testes (in the male) under the thigh. The testes are also retracted spasmodically. At the same time, there are violent sickness, faintness, and collapse, which may last two or three days, and are only relieved when the stone reaches the bladder.'—*The Surgeon's Vade-mecum,* 8th ed. p. 594. The treatment consists in the warm bath, and the inhalation of chloroform, or opium in large doses (both of which serve to allay spasm and deaden pain), the free use of diluents to wash down the concretion, and if the sickness is very severe, an occasional tumbler of hot water containing half a tea-spoonful of carbonate of soda.

URE'THRA is the term given in Anatomy to the canal by which the urine is discharged from the bladder. Its most common affections are the special inflammatory condition of its mucous lining, known as Gonorrhœa (q. v.), and Stricture (q. v.).

U'RFA, or ORFA, the modern name of EDESSA (q. v.).

U'RGA, a town of Mongolia, on the river Tola-stands in a valley, at the height of 4100 feet above sea-level, 350 miles south-east of Irkutsk. In one of the suburbs of the town is a college of Mongolian priests, which is the seat of the Lama of the Mongols. See LAMAISM. The college or convent covers an extensive area, and includes the dwellings of the priests. The population is made up of a colony of Chinese and about 25,000 Mongols, 10,000 of whom are priests. Each family educates one of its children to be a priest. The buildings of the college have of themselves more the appearance of a town than the other quarters of Urga. The number of the inhabitants is not stated.

U'RI, one of the Waldstädten or Forest Cantons of Switzerland, forms part of the Hill Country (see SWITZERLAND) which surrounds the Lake of Lucerne, and is bounded on the west by the cantons of Unterwalden, Bern, and Valais. It has an area of 418 sq. m., and its pop. in 1850 was 14,505; in 1880, 23,694. It consists of one valley, that of the Reuss, about 30 miles in length, and enclosed on all sides by lofty mountain chains, which also include the south-eastern bay or reach of the lake into which the river falls. A great high-road passes through the valley, and terminates on the south at the St Gothard Pass, which connects the Uri with Ticino, and forms part of one of the great routes into Italy. Uri is almost entirely pastoral, and its products are those of its herds and flocks. Goats are very numerous. In the low grounds, there are a few fields of corn and potatoes, and gardens and orchards, but even this cultivation is limited. The population speak a Swiss-German dialect, and are Roman Catholic. Uri is a democracy. The landesgemeinde, held in a meadow once a year, is formed of the whole male population who have reached 20 years of age. The highest power resides in this assembly. The preconsideration and superintendence of the law belongs to the *landrath,* which consists of 7 members chosen by the landesgemeinde, and 61 by the several communes. A governing council of 11 members, with the landamman as president, discharges executive functions. Civil justice is administered in the

highest instance by a cantonal court of 11 members. A tribunal of 7 members decides in criminal causes. Altorf, the capital, is a small town, with less than 2000 inhabitants. A fountain surrounded by stone statues of Tell (q. v.) and his son marks, according to tradition, the spot where the former stood to take his aim, and another that where the boy stood with the apple on his head.

U'RIC or LITHIC ACID ($C_5H_4N_4O_3$) derives its names from its being a constituent of urine and of urinary calculi respectively. In a state of purity, it occurs in the form of a loose white powder or scales consisting of minute crystals, devoid of smell or taste, only very slightly soluble in water (1 part requiring about 15,000 parts of cold, and 1800 of boiling water), and quite insoluble in alcohol and ether. This acid is, however, soluble without decomposition in strong sulphuric acid, and it may be thrown down from this solution by the addition of water. It is also soluble in the carbonates, borates, phosphates, lactates, and acetates of the alkalies, extracting from these salts a part of their base, with which it forms acid urates. Litmus paper is reddened by its moist crystals, or by a hot watery solution. This acid is not volatile, and by dry distillation is decomposed into carbonate of ammonium, urea, cyanuric acid, hydrocyanic acid, &c. On treating a mixture of uric acid and water with gradual additions of peroxide of lead, which is a strong oxidising agent, the uric acid becomes oxidised, takes up water, and becomes converted into allantoin with the production of carbonate of lead, as is shewn by the equation:

$$\overbrace{C_5H_4N_4O_3}^{\text{Uric Acid.}} + \overbrace{H_2O}^{\text{Water.}} + \overbrace{Pb_2O}^{\text{Oxide of Lead.}} =$$

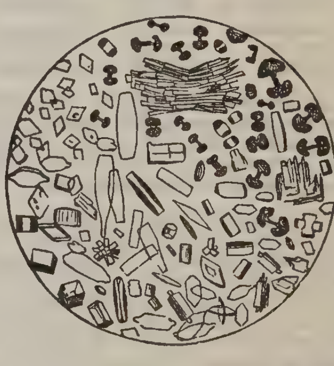
$$\overbrace{CH_4N_2O}^{\text{Urea.}} + \overbrace{C_4H_6N_4O_3}^{\text{Allantoin.}} + \overbrace{CPb_2O_3}^{\text{Carb. of Lead.}}$$

An excess of peroxide of lead in hot solutions of uric acid thus treated converts the allantoin into urea with the formation of oxalic acid. This is a most important result in its physiological bearing, since it shews how uric acid is a probable stage towards the formation of urea, and as explaining a probable source of the oxalic acid, which is often present in the urine in cases of deficient respiration and aëration; and this view is confirmed by the experiment of introducing uric acid into the stomach or veins of an animal, when the presence of oxalate of lime, and the augmentation of urea, are very soon perceived in the urine.

Uric acid is a very weak bibasic acid, forming with bases two series of salts, the neutral and the acid, of which the former are the more soluble. Amongst the most important of these urates are—(1.) *Neutral Urate of Potassium*, which occurs in the form of a white granular crystalline powder, difficult of solution in water (requiring 44 parts of cold, and 35 of boiling water), but readily soluble in an excess of potassium, from which solution carbonic acid throws down the *Acid Urate of Potassium* in the form of a transparent jelly, which sometimes falls in the form of a powder; (2.) Two *Urates of Sodium*, each of which is less soluble than the corresponding potash salt; (3.) *Acid Urate of Ammonium*; (4.) *Acid Urate of Magnesium*; (5.) two *Urates of Lime*; and (6.) *Urate of Lithium*, which is more soluble than any other urate; and hence lithia water is an important therapeutic agent in converting uric acid and the more insoluble urates into a soluble salt in the living body.

Uric acid is widely distributed throughout the animal organism. It occurs not only in the urine of man and carnivorous animals, but is the chief constituent (either free or in combination) of many calculi occurring in the kidneys or bladder, and of numerous urinary sediments. The urinary secretion of birds and reptiles consists almost entirely of urates, which are also found in the excrements of caterpillars, butterflies, beetles, &c., and of many molluscs. Moreover, in very minute quantities, it occurs as a urate in healthy blood, in which fluid it has been found in excess in gout and Bright's disease, and is a constituent of the aqueous extract of the spleen, liver, lungs, pancreas, and brain. The *chalkstones* occurring about the smaller joints, and in the lobes of the ear of gouty patients, consist mainly of urate of sodium.

The best and most ready mode of obtaining pure uric acid is from the semi-solid urine of serpents, which consists almost entirely of urates. The mass is boiled with potash, which expels any ammonia that is present, and a stream of carbonic acid is then passed through the strained potash solution, which throws down acid urate of potassium. This precipitate is dissolved in water, and decomposed by hydrochloric acid, which throws down the uric acid in minute crystals. The form in which this acid crystallises is liable to great variations, as may be seen in the accompanying figure. Sometimes we



Magnified view of Uric Acid in different forms:

The dumb-bell shaped forms seen in upper part of the figure were formerly supposed to consist of oxalate of lime. It has recently been shewn that they are a form of uric acid crystal.

have flat tablets resembling whetstones, or sections with a double knife through biconvex lenses; at other times, more or less perfect rhombic tablets, and sometimes hexagonal plates, barrel-shaped prisms, and toothed crystals. If there is any doubt as to the nature of the crystals, they should be dissolved (under the microscope) in a little potash solution, and a drop of hydrochloric acid then added, when sufficiently characteristic forms are sure to appear.

The marvellous researches of Wöhler and Liebig on the products of decomposition of uric acid by nitric acid, constitute an epoch in organic chemistry. The most important products, some of which are obtained directly, and others indirectly, are: (1.) *Alloxan*, $C_4H_2N_2O_4$ (which, under the influence of various reagents, yields *alloxanic acid, mesoxalic acid, mykomelinic acid*, and *dialuric acid*); (2.) *Parabanic acid*, $C_3H_2N_2O_3$ (which yields *oxaluric acid*); (3.) *Alloxantin*, $C_8H_4N_4O_7$ (which yields *alloxan, allituric acid, uramel, thionuric acid, oxaluric acid*, and *murexide*); (4.) *Murexide*, $C_8H_8N_6O_6$ (which yields *murexan*, or *uramel*, and *alloxan*); and (5.) *Urea*, which breaks up into carbonic acid and ammonia. Moreover, by boiling oxaluric acid with water it is decomposed into oxalic acid and urea. Of these substances, we

shall only notice *murexide*, which has two special claims to notice. It is used as a pigment in dyeing, being probably the old *Tyrian Purple* (see MUREXIDE), and it affords a ready test for a mere trace of uric acid. In using it for the latter purpose, the substance supposed to contain uric acid is heated on a slip of glass with a drop of nitric acid, and carefully evaporated to dryness. If uric acid is present, the residue has a red colour, which is converted by vapour of ammonia into a fine crimson, and the addition of a drop of a solution of potash develops a splendid purple tint, which disappears on the application of heat.

Uric acid must be regarded, like urea, as a product of the disintegration of the tissues; and it is far from improbable that all the urea which is secreted may have pre-existed in the form of uric acid—a view which is supported by the fact, that whatever increases the amount of urea, decreases that of uric acid, and *vice versâ*. See URINE.

URICONIUM. See SUPPLEMENT in Vol. X.

U'RIM AND THU'MMIM (Heb.), a mysterious contrivance in or on the High-Priest's breast-plate, either consisting of the four rows of precious stones upon which the names of the 12 tribes were engraved, or of two images personifying—most probably—'Truth' and 'Revelation.' Luther's translation, 'Light and Truth,' has no more real foundation than that of the LXX. and the Vulgate, which is 'Utterance and Truth.' To this translation, the fact of the picture of 'Truth' (Aletheia)—in sapphire or other precious stones—being suspended from the Egyptian high-priest's breast, had probably given rise. The etymology of the two words, which, derived from Arabic roots, would indicate 'Brilliant Amulet,' 'Perfect Light,' &c., is in reality no more satisfactory than the account of the manner in which the contrivance was used for oracular purposes, or of the time when, in reality, it ceased to act. It is never mentioned after Solomon's time.

U'RINARY SEDIMENTS is a general term which includes all those substances which occur in a non-dissolved state in the urine. Most of these sediments are not formed until after the urine has been discharged and has cooled; some, however, are formed in the urinary organs, and under favouring conditions may give rise to urinary concretions. Hence it is a point of importance to ascertain whether a sediment occurring in a specimen of fresh urine has been formed before or after its discharge.

The chemical and microscopical characters of these sediments has a double bearing on the detection of disease: (1.) 'From the investigation of these sediments,' says Professor Vogel, 'we can draw sure conclusions regarding special changes that are going on in the general nutrition of the body. They shew us that an excessive quantity of certain substances (as, for example, uric, hippuric, or oxalic acid) is being discharged with the urine, and has therefore been produced in the body; and we thus often obtain at a glance information of great importance, which could otherwise only be procured by a tedious process; and (2.) they point out to us certain local diseases of the urinary system. Thus, from a sediment containing pus, we infer that suppuration is going on in some part of that system; and the presence of cylindrical casts or tubes in the sediment informs us of certain morbid changes in the structure of the kidneys; and if the ordinary symptoms reveal the presence of stone in the bladder, we can ascertain its probable nature from the character of the sediment or gravel.'

The mode of formation of morbid sediments is well illustrated by a sketch of the changes which healthy urine undergoes after prolonged exposure to the air. In the course of two or three days, the acidity of the urine is found to have increased, and this condition of *acid fermentation* will frequently continue for some weeks, giving rise to the deposition of (1.) free uric acid; (2.) acid urates (chiefly urate of sodium); and (3.) oxalate of lime. In a few weeks, or often much sooner, the urea becomes alkaline, or *alkaline fermentation* is established, in consequence of the urea being converted into carbonate of ammonium. The urine now becomes paler, while the red or yellow crystals of uric acid are replaced by white amorphous granules and colourless refracting prismatic crystals. In other words, the former precipitate is replaced by (1.) phosphate of ammonium and magnesium (commonly known as triple phosphate); (2.) phosphate of lime;

Fig. 1.

Magnified urinary sediment, consisting of uric acid, urate of soda, and oxalate of lime; from a person convalescent from typhus fever. The uric acid crystals are here chiefly seen in large dense bundles, joined two and two by their bases, each bundle being composed of an enormous number of the long whetstone crystals described and figured in the article URIC ACID (q. v.). The dark crystals with light cross-bars are composed of oxalate of lime; while the dark-coloured granules occurring either singly or in masses are urate of soda.

and (3.) urate of ammonia. In certain forms of disease, these changes take place much more rapidly, and the second change—the alkaline fermentation—may

Fig. 2.

Magnified urinary sediment, consisting of large prismatic crystals of triple phosphate (or phosphate of ammonium and magnesium), and globular bodies often studded with points, which consist of urate of ammonium; from the alkaline urine of a patient suffering from paraplegia, consequent on disease of the spinal cord.

occur without a pre-existing acid fermentation, and even within the bladder. The general characters of the deposits occurring as results of the acid and of

the alkaline fermentations are shewn in figs. 1 and 2. In addition to the above-named substances, which arise from the decomposition of healthy urine, others occur in various morbid conditions of the system; and we may divide the urinary sediments generally into the two great groups of (1.) the unorganised and (2.) the organised deposits. The unorganised sediments include uric acid, the urates (chiefly urate of soda), hippuric acid, oxalate of lime, earthy phosphates (viz., phosphate of lime, and triple phosphate), cystine, xanthine, hypoxanthine (formerly known as guanine), and tyrosine; while the organised sediments include mucus and epithelial scales, blood corpuscles, pus corpuscles, cancerous and tubercular matter, fibrinous casts of the tubes of the kidney, spermatozoa, fungi, infusoria, &c. Of the unorganised sediments, uric acid, the urates (excepting urate of ammonia), hippuric acid, and cystine occur only in acid urine; and urate of ammonia, triple phosphate, and phosphate of lime, in alkaline or neutral urine. Oxalate of lime and the organised sediments occur both in acid and alkaline urine; but alkaline urine is the more natural *habitat* for fungi and infusoria. It is comparatively seldom that a sediment consists of a single ingredient. The crystaline forms of two mixed sediments, one consisting of uric acid, urate of sodium, and oxalate of lime, and the other of triple phosphate and urate of ammonium, as seen under the microscope, are shewn in figs. 1 and 2 respectively. Most of our knowledge on this important subject is due to the labours of English physicians, amongst whom the names of Prout and Golding Bird are especially deserving of notice. For details regarding the mode of treatment suitable in the most important of the sediments, we may refer to the articles LITHIC ACID DIATHESIS, OXALURIA, and PHOSPHATIC DIATHESIS, in this work, and to Dr G. Bird's *Urinary Deposits and their Treatment;* while for details regarding their chemical and microscopical characters, Neubauer and Vogel, *On the Urine*, translated under the auspices of the New Sydenham Society, may be consulted.

U'RINE is the fluid which is secreted or separated by the kidneys from the blood, and it is the principal means of removing the worn-out tissues, especially the nitrogenous and saline matters, from the system. It is a very complex fluid, and its composition varies considerably in different classes of animals, and mainly in accordance with the nature of the food.

Healthy human urine, when freshly discharged, is a clear fluid of a bright amber colour, a bitter, saltish taste, and a peculiar aromatic odour. Its normal reaction is acid, and its specific gravity ranges from 1·015 to 1·025. From a table published in Day's *Physiological Chemistry*, p. 352, it appears that an adult man of ordinary weight (about eleven stones) secretes in 24 hours about 52 fluid ounces (or rather more than two pints and a half) of urine, the range extending from 40 to 70 ounces; and that these 52 ounces yield, on evaporation, 935 grains of solid constituents, the remainder being water, which is expelled by heat. Of these 935 grains, 520 (or more than an ounce) are composed of Urea (q. v.), and 266 of chloride of sodium (or common salt); while the remaining 149 grains are made up of Uric Acid (q. v.), Hippuric Acid (q. v.), sulphuric acid, 32 grains; phosphoric acid, 54 grains; earthy phosphates, 15 grains; ammonia (in the form of hydrochlorate), 11 grains; with smaller quantities (in most cases mere traces) of Creatinine (q. v.) and Creatine (q. v.), xanthine, hypoxanthine, colouring matters, mucus (from the walls of the bladder), iron, silica, and fluorine. The fluid also holds an undetermined quantity of gases (carbonic acid and a little nitrogen) in solution. The most characteristic and important of these ingredients is the *urea*, the daily excretion of which is modified by various circumstances. On a purely animal diet, Lehmann found that he secreted two-fifths more urea than when he was living on an ordinary mixed diet; while on a mixed diet there was secreted almost one-third more than on a purely vegetable diet; while finally, on a non-nitrogenous diet, the amount of urea was less than half the quantity secreted during a mixed diet. The free use of common salt increases the daily excretion of urea, in consequence, doubtless, of its augmenting the rapidity of the destructive action always going on in all the tissues; while alcohol, tea, coffee, and tobacco (whether smoked or chewed) diminish the daily quantity. The only medicine which increases its quantity to any marked degree is *Liquor Potassæ.* The daily quantity is increased in many diseases (typhoid fever and many other acute diseases, especially inflammation of the membranes of the brain), while in Bright's Disease and a few other disorders, it is diminished. The daily amount of excreted *uric acid*, like that of urea, varies with the nature of the food. Thus, for instance, Professor Haughton found that the mean daily quantity of uric acid excreted by meat-eaters and wine-drinkers was 4·5 grains, while vegetarians yielded an average of only 1·48 grains, part of which, moreover, was hippuric acid. As an excess of uric acid is likely to give rise to gravel or stone, it should be generally known that the free ingestion of water diminishes its excretion, while at the same time it increases the amount of urea, into which the uric acid is probably transformed by oxidation. The daily amount is diminished by strong bodily exercise, and increased by repose; the reverse of what holds good in relation to the urea. The amount is increased when the digestive functions are disturbed, as after the use of indigestible food or excess of alcoholic drinks; in those conditions of the system which are associated with much disturbance of the functions of respiration and circulation; and in disorders accompanied with severe febrile symptoms, such as acute rheumatism. Its entire absence seems compatible with perfect health. With regard to *hippuric* acid, there has been much discussion, not only as to the quantity in which it occurs, but as to whether it actually exists in healthy urine. Thus, Weissman, a German chemist, finds that on a mixed diet he secreted more than 40 grains of this acid daily, and on a purely animal diet, only 12 grains. Duchek and Höfle deny that it is a constant ingredient of healthy human urine; and Professor Haughton only met with it once in the urine of ten men. Dr Bence Jones, a very trustworthy chemist, found that a man, A, weighing 152 lbs., and a man, B, weighing 202 lbs., living on a mixed diet, excreted daily, on an average, 4·9 and 6·5 grains of hippuric acid, the corresponding quantities of uric acid being 7·7 and 12·6 grains. In cases of jaundice, no traces of hippuric acid are present, even after the administration of benzoic acid,* which is usually converted in the system into hippuric acid. Hence it may be inferred that a healthy condition of the urine is essential to the formation of this acid in the system. Nothing is known with certainty regarding the diseases in

* Duchek found that when 1 gramme (15·44 grains of benzoic acid was taken, 0·714 of a gramme of hippuric acid was excreted; when 2 grammes were taken 1·857 grammes of hippuric acid, and 0·421 of benzoic acid, were excreted; and the ingestion of 4 grammes was followed by the excretion of 1·714 of hippuric acid and 2·500 of benzoic acid. Hence the limit of conversion had been already exceeded.

which this acid is secreted to excess. The only other characteristic ingredient of the urine is its *colouring matter*. Professor Harley believes that he has isolated the normal urine-pigment, to which he applies the term *urohæmatin;* and from its always containing iron, and on other grounds, he regards it as modified hæmatin or blood-pigment. Mr Schunck has also shewn that indigo-blue, in very small quantity, is almost always present.*

It has been already stated that fresh healthy human urine presents an acid reaction. This reaction mainly depends upon the presence of acid phosphates of the alkalies and earths, although the presence of free acids, such as free hippuric, or possibly lactic acid (which, however, is not a normal ingredient), may occasionally contribute to increase the acidity. To determine the acidity of the collective 24 hours' urine, we take a solution of oxalic acid of known strength, and ascertain the relative quantities of a solution (of definite strength) of caustic soda which are required to perfectly neutralise equal volumes of the urine and of the oxalic acid solution. In this way it is found that the total quantity of free acid in the daily urine of a healthy man corresponds in neutralising power to about 36 grains of oxalic acid. The degree of acidity varies in different parts of the day. Dr Bence Jones first mooted the idea (in 1849), that the respective acidities of the secretions of the kidneys and stomach stood in an inverse relation to one another, and that the urine thus loses its acidity, and may even become alkaline during stomachal digestion. Dr Roberts of Manchester, who has subsequently investigated this point, finds that the effect of a meal on the acidity of the urine begins to shew itself in the second hour afterwards, is most marked during the next three hours, and disappears by the end of the sixth hour, the fluid being almost always positively alkaline during the third and fourth hours. Independently of this periodic alkalinity, the urine may be made alkaline at will by the administration of caustic alkalies, their carbonates or their salts, with organic acids (citrates, tartrates, &c., such as occur in many fruits); whilst after the administration of acids the acidity is much increased.

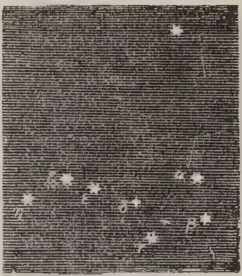
In disease, the urine may either contain only its ordinary ingredients in abnormal proportions, or it may contain ingredients not occurring in the healthy fluid. Thus there may be an excess or diminution of urea, an excess of uric acid, a diminution of chloride of sodium, which, in cases of inflammation of the lungs, may fall from 266 grains to a mere trace, and, by its daily diminution or augmentation, tells with certainty whether the disease is gaining or losing ground; an excess of colouring matter or of mucus, &c.; or, on the other hand, the urine may contain albumen, sugar, oxalic acid (in combination with lime), fat, leucine and tyrosine, bile-pigment, biliary acids, &c. The subject of 'the urine in disease' is, however, so wide a one that we must refer our readers for details to Lehmann's *Physiological Chemistry*, 3 vols. (translated for the Cavendish Society), to Dr Parkes's excellent work on *The Urine*, and to the various works of Dr Beale.

We conclude with a few remarks on the urine of mammals generally. The urine of the Carnivora is clear, of a light-yellow colour, a disagreeable odour, a nauseous taste, and an acid reaction. It contains much urea, little pigment, and little or no uric acid. The urine of the Herbivora is turbid, yellow, of a less unpleasant odour, and alkaline. In addition to urea, it contains hippuric (but no uric) acid, alkaline lactates, carbonates of potash and of the earths, oxalate of lime, and a small quantity of phosphates. By reversing the natural food of these classes, we reverse the characters of the urine.

The urine in many forms of disease becomes turbid on cooling, and soon deposits a sediment; and even healthy urine, after a few days' exposure to the air, loses its clearness, and throws down a deposit of mucus and various kinds of crystals. The investigations of the nature of the deposits thrown down by comparatively fresh urine in disease, is a subject of the highest importance in medicine, and is noticed in the article URINARY SEDIMENTS.

* He failed to detect it in only one case out of forty. He only succeeded in obtaining *one grain* by working for several weeks on the urine of two persons. The urine of the horse and cow yielded comparatively large quantities.

U'RSA MA'JOR, 'the Greater Bear,' and **URSA MINOR**, 'the Lesser Bear,' are two celebrated constellations in the northern hemisphere of the heavens. *Ursa Major* was distinguished as early as the time of Homer by the names *Arktos*, 'the Bear,' and *Hamaxa*, 'the Wagon,' the vivid imagination of the Greeks discovering a fanciful resemblance between these objects and the group of brilliant stars in this constellation. The Roman name Ursa was a translation of the Greek *Arktos;* the Romans also called its seven bright stars the *Septemtriones*, 'the seven ploughing oxen,' whence the adjective *septentrionalis* came to signify north. The common names throughout Europe for these seven stars are 'the Plough,' 'Charles's Wain,' 'the Wagon'—evidently derived from the classical epithets above mentioned. When the constellation of Ursa Minor was generally recognised, the adjective *megale*, 'great,' was annexed by the Greeks, and *major*, 'greater,' by the Romans, to the name of this constellation. The remarkable group of stars in the hinder part of the Great Bear being within 40° of the north pole, never sinks below the horizon of any place in a higher north latitude than 40°, a peculiarity alluded to by Ovid in his *Metamorphoses*. It contains a considerable number of stars, 17 of which are easily visible by the naked eye; but of these, only one (α) is of the first magnitude, two (β and γ) of the second, and eight (among whom are δ, ϵ, ζ, and η) of the third. The accompanying figure shews the arrangement of the seven stars constituting 'the Plough.' α and β are known as 'the Pointers,' from their use in detecting the *Pole-star* (q. v.). A line drawn from the Pole-star through η of the Great Bear, and produced its own length, passes close to the star Arcturus of the first magnitude.—*Ursa Minor* is less prominent in the heavens. It was also *Arktos* and *Hamaxa* among the Greeks, and *Arctus* and *Ursa* among the Romans, from the close resemblance of its chief star group to that of Ursa Major; but was, besides, distinctively denominated *Kynosoura* or *Kynosouris*, and *Cynosura*, 'the Dog's Tail,' from the circular sweep, resembling the curl of a dog's tail, formed by three of the stars in it. The star α in the extremity of the tail of the Little Bear, at present the Pole-star (q. v.), is the brightest in the constellation, though only of the third magnitude.



Constellation of the Plough.

According to the later mythical stories of the Greeks, Ursa Major was the metamorphosis of Callisto, one of Diana's nymphs, who, having violated

her vow, and being transformed by her indignant mistress into a bear, was slain by her son Arcas, and afterwards transferred to the heavens as a constellation by Jupiter; Arcas being at the same time metamorphosed into Boötes, the Arktophylax, 'Bear-warden,' of the Greeks. According to the other but less common legend, which represents the seven stars of Ursa Major as the oxen of Icarius, Arktophylax became *Boötes*, 'the Ox-driver.'

U'RSIDÆ. See BEAR.

U'RSON (*Erythizon dorsatum*), a quadruped early allied to the Porcupine, and often called the Canada Porcupine. The genus *Erythizon* differs from *Hystrix* (Porcupine) in the flatter head, the

Urson (*Erythizon dorsatum*).

shorter and not convex muzzle, the longer tail, and in having the quills short and half hidden in the hair. The U. is about the size of a small hare. It is found as far south as Virginia and Kentucky, and as far north as lat. 67°. Its quills are dyed by the Indian women, and worked into ornamental articles of various kinds.

URSULA, ST, a celebrated saint and martyr of the Roman calendar, especially honoured in Germany, and particularly at Cologne, which is the reputed place of her martyrdom. The legend substantially, in its present form, can be traced as far back as the end of the 11th or beginning of the 12th c., as it is found in the revised edition of the Chronicle of Sigebert of Gemblours (Pertz, *Rerum Germanicarum Scriptores*, viii. 310), which was made between 1106 and 1111. According to this writer, U. was the daughter of the British king Deonatus; and on account of her distinguished beauty, was sought in marriage by the son of a heathen prince who was originally named Holofernes, but afterwards, when a Christian, was called Ætherius. Her father was forced to yield to the demand; but U. made it a condition that her suitor should become a Christian, and that she should be allowed a space of three years, during which she proposed, in company with her maidens, to each of whom should be assigned a thousand companions, and a three-oared galley to convey them, to make a voyage of pious pilgrimage. The conditions were accepted; the maidens, to the number of 11,000, were collected from all parts of the world; and at length the expedition set sail from the British coast. Arriving at the mouth of the Rhine, they sailed up the river to Cologne, and thence upwards to Basel, where, leaving their galleys, they proceeded by land to visit the tombs of the apostles at Rome. This pilgrimage accomplished, they descended the river to Cologne, which, however, had meanwhile fallen into the hands of an army of Hunnish invaders, under the headship of a chief, who, although not named, is plainly the Attila of history. Landing at Cologne in ignorant security, the pious virgins fell into the hands of these barbarous heathens, by whom they were all put to the sword, with the exception of U., who, for her beauty's sake, was reserved as a prize for the chief. She too, however, as well as another maiden, who had at first concealed herself in terror, demanded to join her companions in martyrdom; and thus the full number of 11,000 victims was made up. Heaven, however, interposed. A host of angel warriors smote the cruel Huns; Cologne was again set free; and in gratitude to their martyred intercessors, the citizens erected a church on the site still occupied by the church now known under the name of St Ursula. Such is the legend as told by Sigebert, although it has undergone some modifications in late hands. The improbabilities and anachronisms of this legend were early observed; and it became the subject of an animated controversy soon after the Reformation. On the one hand, the centuriators of Magdeburg exposed its weak points with unsparing severity; on the other, a Jesuit father, Crombach, devoted an entire folio volume to the vindication of the substantial truthfulness of the narrative. Many suggestions have been offered as explanations of its most startling improbability—viz., the alleged number of the martyred victims, 11,000. One of these is, that this belief arose from the name of a virgin who was really the companion of U.'s martyrdom—*Undecimilla.* The record of the martyrdom in the calendar thus being 'Ursula et *Undecimilla V V.*,' 'Ursula and Undecimilla Virgins,' was easily mistaken for 'Ursula et *Undecim millia V V.*,' 'Ursula and *eleven thousand virgins.*'

Secular inquirers into the origin of the U. legend deny that it has the slightest foundation in any historical facts. They find the first traces of the reverencing of these virgins in martyrologies and missals of the latter half of the 9th c., in which mention is made either of a very small number of virgins whose names are given, or a larger indefinite number without names. In one metrical martyrology of this period, by Wandalbert, a monk of Prüm, they are already spoken of as thousands; and after the end of the 9th c. the number of 11,000 is found in the calendars. The name of U., however, does not occur till after the 10th c.; and it was not till the 12th c., that the reverence for U. became predominant over that of the associate virgins. With the 12th c. begins the discovery of the sacred bones. The *ager Ursulinus* was revealed by a vision in 1106; and at first, single skeletons were raised with the greatest solemnity; but beginning with 1155, the digging up of the field was carried on systematically for nine years, in the course of which thousands of skeletons were found, male as well as female, besides coffins, stone tablets with inscriptions, and the like. What the several relics were was revealed to a nun named Elisabeth, then living in the diocese of Trier, to whom the holy martyrs appeared in visions. In this way were identified a pope of the name of Cyriacus, an archbishop, several cardinals, bishops, and priests, and also Ætherius, U.'s bridegroom, along with whose title the cross, a crown, and other royal insignia were represented. It was also explained how all these men came to be in the company of the pious virgins. Even the children's bones found among the others were accounted for by revelations made forty years later to an abbot at Arnsberg, which confirmed and supplemented those of Elisabeth. The numerous human remains found in the Ursulan field at the north side of the city have been accounted for by antiquaries, by making it out to have been the burying-ground of the ancient Roman *Colonia Agrippina.* The origin of the legend is accounted for by Schade in his work *Die Saga von der Heiligen Ursula* (Han. 1854), on

the theory that it is a Christianised relic of old German paganism, in which U. has taken the place of the ancient goddess worshipped by the Scandinavians as Freyja (q. v.), and still remembered by the German people under the names of Berchta (q. v.), Hulda (q. v.), &c., and in Sweden by the very title of 'Old Urschel.'

But without pursuing further this curious inquiry, it will be enough to say, as concerns the Roman Catholic view of the matter, that while the most learned of the Catholic hagiographers, putting aside the idea of a directly and intentionally invented narrative, have traced the origin of the legend to a real historical massacre of a very large number of Christian maidens, which took place during the invasion of Attila, and soon after the celebrated battle of Chalons in 451, all the modern writers of that church are agreed in regarding the details of the narrative, the number, the pilgrimage to Rome, the interposition of the heavenly host, &c., as legendary embellishments of the medieval chroniclers.—See, for the full exposition and vindication of the history, Crombach, *Ursula Vindicata* (fol. Coloniæ, 1647); and for a more critical exposition of the historical foundations on which it rests, Binterim's *Calendarium Eccles. Germ. Colon.* (Cologne, 1824), and the *Zeitschrift für Phil. und Kathol. Theologie* (1850), *Heft* 2.

URSULINES, a religious order of females in the Roman Catholic Church, taking their name from the saint and martyr who forms the subject of the above article. They take their origin from Angela Merici, a saint of the modern church, born, according to the more received account, at Desenzano, in the latter part of the 15th century. She formed at Brescia an association of young females who bound themselves by a vow to labour for the tending of the sick, the instruction of children, the relief of poverty, and other such works of charity. After a time, a rule, in twenty-five chapters, was projected by Angela, and finally approved by the Bishop of Brescia, Cardinal Francis Cornaro. Angela was herself chosen as the first superior, in the year 1537, the community even at that time numbering as many as 76 sisters. During the lifetime of Angela, and for more than twenty years after her death, which occurred in 1540, the congregation was confined to the diocese of Brescia; but in the year 1565, a house was opened at Cremona; and with the approval of Popes Gregory XIII. and Clement VIII., it was spread over many dioceses of Italy. It was warmly encouraged by St Charles Borromeo, and at his death there were no fewer than 28 convents of the order in his diocese, comprising above 600 nuns. Soon afterwards, it was established in France, where one of its most distinguished members was the celebrated sister, Madeleine de St Beuve. It was in France that the sisters, although from the beginning they had been engaged in teaching, first formally added to their religious vows that fourth vow to devote themselves to the instruction of female children, which has since formed the great characteristic of the order. They were introduced into Savoy by St Francis de Sales in 1635; and in 1639, a convent was opened in Quebec, in Canada. About the same time, they were introduced into Germany—at Vienna in 1660, and at Freiburg, Kitzingen, and Prague soon afterwards—where they have continued to teach with great success; and their convents in various parts of Germany, but especially in Austria, at present number 36. The Ursuline sisters have several educational establishments in Ireland, in England, and in the United States, and may fairly claim the merit of having been mainly instrumental in maintaining among Catholics the education of female youth of the higher order through the 17th and 18th centuries. They have found many competitors among the younger sisterhoods of modern times.—See *Journal des Illustres Religieuses de l'Ordre de Ste Ursule*, 4 vols. 4to. (1690); *Chroniques de l'Ordre des Ursulines*, 2 vols. (Paris, 1676).

URTICA'CEÆ, or **URTI'CEÆ**, a natural order of exogenous plants, consisting of trees, shrubs, and herbs, natives of almost all parts of the world. According to many botanists, the order includes about 600 known species; whilst others, restricting it by separating from it several distinct orders, reduce it to about half that number, of which the common nettle may be regarded as the type. The leaves of all are alternate, furnished with stipules, and generally very rough, sometimes with stinging hairs. The inflorescence is various; the perianth usually divided, but sometimes a mere scale; the stamens inserted into the perianth, equal in number to its segments, when it is divided, and inserted at their base; the ovary free, one-celled, containing a single ovule. The fruit is a kind of nut, surrounded by the persistent and sometimes fleshy perianth, sometimes winged; and sometimes the fruits are variously aggregated. Under this description are comprehended *Cannabinaceæ* (q. v.), *Ulmaceæ* (q. v.), *Moraceæ* (q. v.), and *Artocarpaceæ* (q. v.), as well as the restricted U., which have filaments curved in bud, and turning backwards elastically when the anthers are bursting, the fruit an unopening nut. The juice of the restricted U. is watery, not milky; the wood in the arboreous or shrubby species, which are all tropical, is remarkably soft and light. The fibre of the bark of some is valuable. It is amongst the restricted U. that species covered with stinging hairs are found. See BŒHMERIA, NETTLE, NEILGHERRY NETTLE, and PELLITORY.

URTICA'RIA. See NETTLE-RASH.

URUGUAY', otherwise **BANDA ORIENTAL DEL URUGUAY**—i. e., 'the Eastern Bank of the Uruguay,' is a small South American state, bounded on the N. and N.-E. by Brazil, on the E. and S.-E. by the Atlantic, on the S. by the Rio de la Plata, and on the W. by the Uruguay. It is nearly square in shape, and its greatest length and its greatest breadth are over 300 miles. Area, 71,752 sq. m.; pop. (1870) 387,421. The interior of U. is very imperfectly known. In the south, all along the Rio de la Plata, and as far north as the Rio Negro, the country is a sort of terraced upland, with a bold, broken, treeless coast-line, possessing some excellent harbourage; while the shores facing the Atlantic are low and sandy. Further east, rises a woody plateau; but high, bare, grassy plains, traversed by ranges of low hills, seem to be the predominant feature. The climate is mild; rain falls pretty copiously in winter, but is rare in summer. The most important rivers are the Rio Negro, the Daiman, the Arapey, the Yaguaron, and the Sebollati. Agriculture is in a very backward state, although the soil is naturally rich. Small quantities of wheat, maize, barley, rice, peas, beans, flax, hemp, and cotton are raised, and fruit trees thrive well; but the wealth of the country consists in its splendid pasturage, which supports great herds of horned cattle, horses, and sheep. The wool of these Uruguayan sheep is of a superior quality. The wild animals embrace the tapir, deer, ounce, monkey, paca, rabbit, and fox; and large packs of wild dogs infest the plains. U. has almost no manufactures, and very little commerce, as yet. The chief exports are jerked and salted beef, tallow, hides, horn, and hair; and the chief imports woollen goods, household furniture of

all kinds, sugar, cordage, agricultural implements, timber, &c. In 1869, the annual value of the exports amounted to 16,830,678 piastres or dollars; and that of the imports to 13,386,886 piastres or dollars. The capital of U. is Monte Video (q. v.), and the other towns of note are Maldonado and Colonia del Santo Sacramento.

U. was originally colonised by Spanish settlers from Buenos Ayres, on the other side of the La Plata; but the territory which forms the natural limit of Brazil on the south was claimed by Portugal, and a war ensued between the two nations for its possession, which terminated in favour of Spain. U. was now attached to the vice-royalty of Buenos Ayres, and received the name of *Banda Oriental*—i. e., as has been explained above, the country on the eastern bank of the Uruguay. Its independence was secured by treaty in 1828, when it took the title of *Republica del Uruguay Oriental;* but like most of the South American republics, it has suffered almost incessantly from internal discords.

URUMEYAH, URUMIJAH, URMEA, Lake, called also the *Lake of Maragha* (q. v.), *Lake of Tabriz*, and by the neighbouring peoples, *Kapauta* (Armen. *kapoit*, blue), the principal lake of Persia, is situated in the west of Azerbijan, about 34 miles west from Tabriz. The lake, which is 4320 feet above sea-level, is about 80 miles in length from north to south, has an average width of 25 miles, and contains more than 1900 Eng. sq. miles. It is one of that class of lakes which receive, but do not emit streams; and despite the fact that its feeders include such rivers as the Aji-su, 180 miles long; the Jage-tu, 140 miles long; and the Ta-tu, 90 miles long, it has only an average depth of 12 feet. The water is largely impregnated with saline substances (according to one authority, the salts constitute 25 per cent. of the whole weight), and is so heavy as to be little ruffled by the strongest wind. No fish or mollusca are found in it. Six large isles, and a multitude of islets and rocks, shew themselves just above its surface, being mostly grouped together near its centre. The lake is fast drying up, leaving a gradually widening beach of thick saline incrustation, which supplies with salt the whole of Kurdistan. The lake was known in ancient times as *Matiana*, or *Mantiana*.

URUMEYAH, a town of Persia, situated 10 miles west of the lake, in a wide and fertile plain, is surrounded with a mud wall and moat, but has no gates. Extensive fruit and vegetable gardens are situated both within and without the walls. The houses of the better classes are lofty, spacious, and sumptuously furnished; and many of those of the poorer classes are tastefully adorned with flowers and vines. U. is the residence of a Persian governor, of a Nestorian bishop, and of an American mission; it has a pop. of about 22,000, a large number of whom are Nestorian Christians and Jews. U. was anciently known as *Thabarma*, or *Thebarmæ*, and was held in great veneration by the Persians, by reason of the legend which fixed it as the birthplace of Zoroaster (q. v.). In 624 A. D., the town, including a magnificent fire-temple, was destroyed by the Emperor Heraclius.

U'RUS, a great animal of the ox-kind, which anciently inhabited the forests of Central Europe, and is described by Cæsar (*Bell. Gall.* vi. 28) as common in the great Hercynian Forest; as scarcely less than an elephant in size—an evident exaggeration—but otherwise resembling an ox, of great strength, of great swiftness, and of great fierceness. He mentions that the horns were very different from those of the oxen of Italy—large, spreading, and sharp. This character is found in the wild cattle of Chillingham and other parks in Britain, and in some of the Highland breeds of oxen; and the probability seems to be that the U. was the wild original of the domestic ox, and not a bison, nor any now extinct species, although some authors, apt to constitute species upon very slight grounds, maintain a contrary opinion.

URVAS'Î. See PURÛRAVAS.

USBEGS, or USBEKS, a people of Turkish race, who, at the close of the 15th c. of the Christian era, invaded and conquered the numerous principalities into which Turkestan was at that time divided, and have ever since maintained dominion over the country. At the present day, they are for the most part a settled people, occupying themselves in the cultivation of the soil and in trading, and are scattered over both Independent and Chinese Turkestan. The most probable supposition regarding their origin is that they immigrated from Kiptchak (q. v.), and assumed the name of U. from Usbeg, one of their chiefs. The U. of Khiva, Bokhara, Khokan, and of Chinese Turkestan, differ from each other in language, manners, and customs. Those of Khiva speak a dialect of the Turkish, are honest and generous, and destitute of the treachery and duplicity which are so characteristic of oriental civilisation, are passionately fond of music and poetry, and, though zealous Mohammedans, still retain many of their ancient heathen usages. They pride themselves much on the purity of their Usbeg descent, but most of them shew evident traces of an admixture of Iranian blood. The U. of Bokhara have become largely mingled with the Tajiks, and have consequently lost many of their national characteristics. Those of Khokan are very different from the two previous, and are as much Kirghis, Kiptchaks, and Kalmucks as they are U.; the fact that the U. have been the dominant race in Turkestan for three centuries and a half, having given the name such a prestige of nobility and good-breeding, that it is generally assumed by such members of other races as settle in cities.

USE AND OCCUPATION is the technical name given in the law of England to the beneficial enjoyment of premises by a tenant, who occupies the real property of another, such as houses and farms. In all cases where a person has had use and occupation of another's premises, with the assent of the owner, an action lies for the value thereof, which value corresponds to rent under an ordinary lease. Hence, where it is doubtful whether there has been a valid lease executed between the parties, the landlord can nevertheless recover rent under the head of use and occupation.

U'SEDOM, an island belonging to Prussia, lies at the mouth of the Oder, and together with the island of Wollin, shuts off the Stettiner Haff from the Baltic. It is of very irregular shape, being much indented by branches of the Haff, is 34 miles in extreme length, and 15 miles broad. Area about 148 sq. m. On its north-east side is the port of Swinemünde (q. v.); on the south side is the small town of Usedom, with 1500 inhabitants.

USES, in the law of England, is the old name for trusts, which has superseded the other in most respects. Uses and trusts correspond to the *fidei commissum* of the Roman law. A use was a confidence reposed in another who was tenant of the land, or *terre-tenant*, that he should dispose of the land according to the intention of the *cestui que use*, or him to whose use it was granted, and suffer him to take the profits. See TRUST.

U'SHANT (Fr. *Ouessant*), an island in the Atlantic Ocean, belongs to France, and is included in the dep. of Finisterre, from the west coast of which it is distant about 17 miles. It is the largest of a small group of islets called the *Iles d'Ouessant*, has an area of 7 sq. m., and contains about 2271 souls. The coasts are escarped and difficult of access; the soil is fertile. The inhabitants are employed in fishing, and in rearing cattle and horses.

USHAS (from the Sanscrit *ush*, 'to shine, to burn,' and kindred with the Greek *ēōs* or *heōs*, and the Latin *aurora*), 'the Dawn,' is one of the female deities of the Vedic religion of India (see INDIA, sec. *Religion*), and amongst these is invoked with special predilection by the poets of the R'igveda hymns. The invigorating influence which the dawn exercises on body and mind, and the luminous and other phenomena connected with the beginning of the day, form the subject of some of the best portions of Vedic poetry; and out of them Ushas arises as one of the most pleasing goddesses of the ancient Hindu pantheon. She is invoked as 'the affluent,' as 'the giver of food,' and 'the bringer of opulence;' she is asked to bestow on the pious 'riches with horses and cattle,' 'posterity and troops of slaves;' and she is praised for the many boons she has showered on the worshippers who were liberal to her. She is the goddess 'endowed with an excellent intellect,' and the 'truthful,' or fulfiller of her promises. 'She animates the diligent;' when she appears, 'bipeds and quadrupeds (are in motion),' 'the winged birds flock around from the boundaries of the sky,' and 'men who have to earn their bread quit their homes.' She rides in a 'golden chariot,' which is 'ample and beautiful;' and the Sanscrit word *go* meaning a cow (or, as a masculine, an ox), and also a ray of light, she is not only 'the mother of the rays of light,' or attended by them, and rays of light are her banner, but her chariot is drawn by 'ruddy *kine*,' or, as they are sometimes called, 'ruddy oxen.' Less frequently she is spoken of as travelling with horses; for the horse, as a symbol of light, is more especially appropriated to the god of the sun. The relation of Ushas to other Vedic deities is of a twofold, a physical and a ritual, character, inasmuch as the phenomena of dawn are connected with other phenomena of nature, and as certain religious ceremonies are performed at daybreak. On these grounds, she is frequently addressed as 'the daughter of heaven;' and when her 'parents' are spoken of, the commentator explains this word as implying 'heaven and earth.' She is further called the daughter of night (night being the precursor of the dawn); but, on other occasions, she is also spoken of as having night for her sister. She is, besides, the sister of the two luminous deities, *Bhaga* and *Varun'a*, and the faithful wife of *Sûrya*, the sun. According to an old commentator (*Yâska*), she would in one passage of the R'igveda also be the deity 'who has the sun for her child,' 'either because the sun is her companion, or because he absorbs the moisture (i. e., the frost);' but as *rus'advatsâ*, the word, so interpreted, admits also of another rendering, it is doubtful whether she bears this epithet, the more so as in another passage the sun is said to follow Ushas as a man follows a woman. The As'wins being the luminous twin-gods, who probably represent the transition from darkness to light, and therefore that intermingling of both which becomes inseparable (see John Muir's 'Contribution to a Knowledge of the Vedic Theogony and Mythology,' in the *Journal of the Royal Asiatic Society*, new series, vol. ii., 1866), Ushas is called their 'friend'—according to Sâyan'a, also their sister; she 'follows their lustre,' and 'awakes' them to partake of the Soma prepared for them; and in their turn they are asked 'to unite with the dawn. Another god, who originally on physical grounds is associated with Ushas, is *Indra* (q. v.), the ruler of the bright firmament. He 'generates (i. e., causes to appear) sun and dawn,' and 'appoints them to their office,' which is that of dispelling darkness; but though, 'when (in the morning), desiring (the Soma), he honours the dawn,' his ascendency during the day becomes fatal to her; for then 'he slays her,' 'breaks her chariot;' and 'her shattered chariot reposing on (the banks of) the river Vipâs', she departs from afar.' Most of these deities become, in consequence, associated with Ushas also as sharers in certain sacrifices which are offered to her; and besides these, Agni, the god of fire, who carries the offerings to the gods, and Soma (q. v.) Like many of the most poetical deities of the Vedic creed, also Ushas is excluded from the Hindu pantheon of the classical period. Her place is there taken by *Arun'a* (the ruddy), whom the epic poems and the Purân'as make the son of the patriarch Kas'yapa and his wife Vinatâ, and the younger brother of Garud'a, the bird-vehicle of Vishn'u. According to the *Mahâbhârata*, he was appointed by the gods to the office of charioteer of the sun, in order to intercept his fiery heat, when the sun, angry with the gods for being exposed to the enmity of Râhu (q. v.), it was feared, would consume the world. Where represented, *Arun'a* is therefore seated before the sun on his chariot, driving his horses; but as the legends deprive him of his legs, his body is seen perfect to his knees only.

USHER, JAMES, Archbishop of Armagh, and by common consent the most learned prelate that ever adorned the Irish Protestant Church, belonged to one of the oldest Anglo-Irish families, and was born in Dublin, January 4, 1580. His father, Arnold Usher, one of the clerks in Chancery, was a gentleman of good estate, and his uncle, Henry Usher, preceded him in the archbishopric of Armagh. At the age of 13, he entered Dublin College, where his predilection for history soon revealed itself. Having resolved to devote himself to the service of the church, he proceeded, after the solid fashion of the times, to read up the entire literature of ecclesiastical antiquity—a task which occupied him from his twentieth to his thirty-eighth year! In 1601, he was ordained deacon and priest, and was shortly after appointed preacher at Christ Church, Dublin. In 1607, he was chosen to the chair of Divinity, a post which he held for 13 years. In 1609, he made one of his numerous visits to England, in the course of which he made the acquaintance of the most distinguished scholars of the age. In 1613, his first publication appeared, entitled *De Ecclesiarum Christianarum Successione et Statu*, which was designed as a continuation of Bishop Jewel's *Apology*. The work was divided into three parts, of which only the first, reaching to the period of Hildebrand, and part of the second, were finished. In 1615, he was appointed, by a convocation of the clergy held at Dublin, to draw up a series of articles (the number amounted to 104) relating to the doctrine and discipline of the Irish Protestant Church, in which the doctrines of predestination and reprobation (of which U. was an unflinching apologist) found prominence. These and other views, such as, that bishops were not a different *order* from presbyters, that the Sabbath should be strictly enforced, that no toleration should be granted to Catholics, laid him open to the charge of Puritanism; but as his loyalty to the principle of monarchy was undoubted, he suffered no diminution of the royal favour; on the contrary, King James promoted him to the bishopric of Meath in 1620; and in 1623, constituted him a privy-councillor of

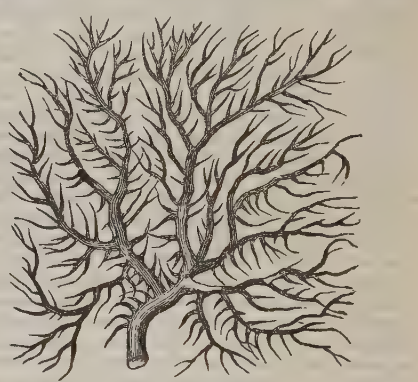
Ireland. Two years later, he was raised to the highest ecclesiastical dignity in the kingdom, the archbishopric of Armagh, and in his official capacity 'vigorously' opposed the toleration of popery and the spread of Arminianism. In 1632, U. published *Veterum Epistolarum Hibernicarum Sylloge*, a collection of letters out of several ancient MSS., concerning the state of the Irish Church from 592 to 1180; in 1638, *Emmanuel, or a Treatise on the Incarnation of the Son of God;* in 1639, *Britannicarum Ecclesiarum Antiquitates*, which is said to contain 'a most exact account of the British Church, from the first planting of Christianity, twenty years after our Saviour's crucifixion, down, both in Britain and Ireland, to the end of the seventh century;' in 1641, *The Judgment of Dr Reynolds concerning the Original of Episcopacy defended*, *The Original of Bishops*, *The Power of the Prince and the Obedience of the Subject*, &c. When the Civil War broke out, U., who was in England at the time, espoused the side of the king, refused to sit, when nominated, among the Assembly of Divines at Westminster, and made himself very obnoxious to the parliament by the sermons which he preached at Oxford. When the fortunes of the king began to decline, U. left Oxford; his property and revenues in Ireland were seized, and after a residence in Wales and elsewhere, he came to London in 1647, where, in spite of his royalist sympathies, he was chosen by the benchers preacher of Lincoln's Inn, a post which he retained till his death, March 21, 1656. Cromwell, who had a great respect for his learning, ordered his remains to be interred with great magnificence in Erasmus's Chapel in Westminster Abbey. U. was a man of undoubted ability and of enormous erudition, pious and free from worldly ambition; but he lacked force of character, real insight and intellectual power; hence, though pronounced by Dr Johnson 'the great luminary of the Irish Church,' he exercised less influence over the course of contemporary events than the humblest of Cromwell's Ironsides. Nor can it be shewn that posterity is very deeply indebted to him for more than the example of a virtuous and studious life. U.'s chief works, besides those already mentioned, are his edition (1644) of the *Epistolæ* of Polycarp and Ignatius; his treatise *De Romanæ Ecclesiæ Symbolo* (1647); *Dissertatio de Macedonum et Asianorum Anno Solari* (1648); and *Annals of the Old Testament* (1650—1654), a chronological work. After his death, there were published (from his numerous MSS.), *Chronologia Sacra*, &c. (Oxford, 1660), by which and his *Annals* he is most widely known; a volume of *Sermons; Historia Dogmatica Controversiæ inter Orthodoxos et Pontificios de Scripturis et Sacris Vernaculis* (Lond. 1690); *A Collection of three hundred Letters written to James Usher, Lord Archbishop of Armagh*, to which is prefixed a life of the archbishop by his chaplain, Richard Parr, D.D. (Lond. 1686). A collected edition of U.'s works, in 16 vols., with a new biography, was published at Dublin in 1841, by Dr Elrington.

USHER OF THE BLACK ROD, one of the officers of the order of the Garter (q. v.), coeval with the institution of the order, and originally called 'Hostiarius capellæ regis infra castrum de Windsor.' The rod from which his title is derived is of ebony, mounted with gold, 3½ feet in length, having at the top a lion sejant, holding before him in his fore-paws a gold shield charged with the royal cipher in gold surrounded with the Garter. He has a mantle like that of Garter King of Arms, and his badge is a gold knot surrounded with the Garter, and ensigned with the royal crown. It is the practice to unite this office with that of the king's first gentleman usher daily waiter at court, who is one of the chief officers of the House of Lords. In the capacity, it is one of the functions of the Gentleman Usher of the Black Rod, or of his deputy, who is known as the Yeoman Usher of the Black Rod, to desire the attendance of the Commons in the House of Lords when the royal assent is to be given to bills by the sovereign or Lords Commissioners; also to execute orders of commitment for breach of privilege and contempt, and to assist at the introduction of peers, and other ceremonies of the Upper House.

USHER OF THE GREEN ROD, one of the officers of the order of the Thistle (q. v.), whose duties consist in attendance on the sovereign and knights when assembled in chapter, and at other solemnities of the order. The rod from which the title is taken is of green enamel, three feet in length, ornamented with gold, having on the top a unicorn of silver, holding before him an escutcheon charged with the cross of St Andrew.

U'SKUP, or **SCO'PIA**, a town of European Turkey, in Rumili, on the Vardar, 120 miles north-west of Salonica. The town, which is built on hilly ground, contains 16 mosques, with black domes and minarets, interspersed among fruit trees. Here are the ruins of an ancient Roman aqueduct, consisting of 55 arches. Leather is manufactured. Pop. estimated at 10,000.

U'SNEA, a genus of lichens, having a much branched thallus, with an elastic thread in the centre. Some of the species are natives of Britain. They grow on trees, and are generally pendulous.



Usnea barbata.

They contain the vegetable principle called *Usnine*, which, however, is also found in many other lichens. They are sometimes used in dyeing, like archil and cudbear. From their appearance, many of the species of U. receive the popular name of BEARD-MOSS.

USTILA'GO. See SMUT.

U'SUFRUCT, in Scotch Law, is adopted from the Roman Law, to denominate one of the three personal servitudes, which were use, usufruct, and habitation. Usufruct is better known under the name of Life-rent (q. v.), or Estate for Life (q. v.).

U'SURY. See INTEREST.

U'TAH (named from an Indian tribe Utah, or Utes, dwellers in mountains), a territory of the U. S., lying between latitude 37°—42° North, and longitude 109°—114° West, containing 84,476 square miles, bounded north by Idaho and Wyoming, east by Colorado, south by Arizona, and west by Nevada. Its chief town and capital is Salt Lake City (q. v.). Utah is an immense basin, from four thousand to six thousand feet above the level of the sea, surrounded

by mountains, which at some points reach the altitude of 8000 to 13,000 feet. Excepting Green and Grand rivers, in the east and south-east, Santa Clara river in the south-west, and the head branches of the Colorado, which flows through a cañon 1200 feet in depth, its rivers empty into the Great Salt Lake, in the northern centre of the territory, and similar salt lakes or inland seas. This great basin, which includes the new state of Nevada, is formed by the Wahsatch Mountains on the east, and the Sierra Nevada on the west. The formations are primitive and metamorphic, with secondary basins 15 or 20 miles wide. The principal mountains lying within the territory are the Humboldt range, 6600 feet high in the west, and the Wahsatch in the south, 12,000 feet. There are numerous lakes, usually without outlet, except into each other, many thermal springs and salt springs. The rocks are mostly primitive, and rich in granite, jasper, syenite, porphyry, and quartzes, shewing everywhere evidences of volcanic action. There are also ridges of carboniferous limestone containing calcareous spar; and near Salt Lake City occur boulders of serpentine, fine gray granite, sandstones, conglomerates, talcose and striated slates, gypsum, limestone, and marble of every hue in large masses. Iron is abundant; and there have been found gold, silver, copper, zinc, lead, inexhaustible quantities of bituminous coal, sulphur, alum, borax, and petroleum. Among the animals are the antelope, elk, deer, Rocky Mountain sheep, cougar, catamount, wolves, foxes, beavers, porcupines; quail, grouse, swans, wild geese, pelicans, ducks; perch, pike, basse, and salmon-trout of 30 lbs. weight. Generally, vegetation is not luxuriant, and timber, except pines and firs in the mountains, scarce. The country has good grass for grazing, and some wild fruits. The climate is bleak and changeable, with deep snows and intense cold in winter, and heats in summer, accompanied with storms of thunder and dust. The soil, as a whole, may be described as barren, with spots of remarkable fertility, producing 60 to 100 bushels of grain to the acre. Much of the soil is strongly alkaline. The chief crops are wheat, oats, barley, maize, buckwheat, flax, hemp, fruits. Cattle and sheep are abundant. The chief manufactures are those required in a new country, as farming-implements, furniture, carriages, woollen goods, leather, steam-engines, and machinery and cutlery, in which are employed a large number of skilled English artisans.

The pop. of U. consists almost entirely of Mormons, or members of the Church of the Latter-day Saints, governed by a hierarchy. In 1860 they numbered 40,295 according to the census, and in 1870 they had increased to 86,786. The total population of the territory in 1880 was 143,963. Probably three-three-fourths of them are emigrants from Great Britain, and a large number are from Sweden and the north of Europe. See MORMONS.

Provision has been made for education, in the foundation of a university, a free academy, and common schools. There are two weekly newspapers. There is a United States territorial government, with governor, secretary, marshal, and judges appointed by the president, and a legislative assembly elected by the people. In 1871 action was taken in the United States courts against polygamy as a criminal practice. The Central Pacific Railroad passes through Northern Utah, with a branch to Salt Lake City.

The Shoshones, Utes, and other Indians, numbering about 12,800, are in the Utah superintendency.

U'TERUS. See WOMB.

U'TICA, a city of New York, U. S., on the Mohawk River, at the junction of the New York Central and Utica and Black River Railways, and the Erie and Chenango Canals, 95 miles west-north-west of Albany. The city, regularly and handsomely built, rises from the south bank of the river to an elevation of 150 feet. Among its buildings are a city hall, public halls, 26 churches, 6 large hotels, 4 banks, a cotton-mill, 2 woollen-mills, a state lunatic asylum with 500 patients, Catholic and Protestant orphan asylums, academies, and schools. There are also manufactories of flour, starch, organs, pianofortes, clothing, carriages, machinery, carpets, oil-cloth, &c.; and 11 newspapers and periodicals, of which 2 are Welsh and 1 German. At the period of the revolution, U. was a frontier trading-post, and the site of Fort Schuyler, built to guard the settlements against th French and Indians. In 1813, it had a pop. of 1700 in 1860, 22,528; in 1870, 28,804; in 1880, 33,914.

UTILITA'RIANISM, the name of the peculiar theory of Ethics, or of the ground of moral obligation, that adopts, as the criterion of right, the happiness of mankind. The word 'Utility' was employed, in this acceptation, by Jeremy Bentham; the form 'Utilitarianism' was first used by John Stuart Mill.

The doctrine of Utility is opposed to all those theories that refer us to some internal sense, feeling, or sentiment, for the test of right and wrong; a test usually described by such phrases as a Moral Sense, and Innate Moral Distinctions. See ETHICS. Whence Utility is sometimes termed the *external* or objective standard of morality. It is also opposed to the view that founds moral distinctions on the mere arbitrary will of God.

The Utilitarian theory has been maintained both in ancient and in modern times, although with considerable variation, not merely in the mode of stating it, but in important peculiarities. Thus, in ancient times, it was held by Epicurus, but in a purely self-regarding form; each person's end was his own happiness exclusively, the happiness of others being instrumental and subordinate. The modern phase of the theory may be said to begin with Hume. He employed, as the leading term of his system, not Utility, but Benevolence; whereby he gave especial prominence to the disinterested side of moral actions. He strenuously maintained, what must be regarded as the essential feature of the Utilitarian doctrine, that no conduct is to be deemed worthy of moral approbation, unless, in some way or other, it promotes human happiness; and that actions ought to be visited with disapprobation, exactly according as they have the opposite tendency.

Jeremy Bentham is, more than any other person, identified with the theory of Utility, which was in his hands, not merely the foundation of Ethics, but also the basis and justification of political and legal reforms. Having in view the state necessity of sacrificing smaller interests to greater, or, at all events, of not sacrificing greater interests to smaller, he described the ethical end as 'the greatest happiness of the greatest number.' He illustrated the doctrine by setting it in opposition to *asceticism*, which he interpreted to mean, that pleasure is forfeited, and pain incurred, without yielding a compensating amount of good, either to the agent or to other persons.

Paley advocated a form of Utility. He made the will of the Deity, enforced by future rewards and punishments, the impelling motive to duty; but in determining what that will was, in particular cases, he included a reference to the beneficial tendency of actions.

James Mill maintained substantially the views of Bentham. Sir James Mackintosh, while differing in some points from Bentham and from Mill, in the main adhered to Utility as the ultimate standard of

right. John Austin, in his *Province of Jurisprudence Determined*, has contributed a lucid exposition and a powerful defence of the principle. John Stuart Mill has devoted a separate work to the subject. Samuel Bailey, in his *Letters on the Human Mind*, vol. iii., has discussed the ethical problem fully, and pronounced upon the utilitarian side. Herbert Spencer ranks among the upholders of the theory; and likewise Bain, in his edition of Paley (Chambers's series), and in *The Emotions and the Will*.

Before stating the arguments for and against the principle of Utility as the basis of morals, it is proper to inquire what sort of proof an ethical system is susceptible of. Ethics is a practical science (see SCIENCES), and, as such, involves an end; having the peculiarity of being the final or comprehensive end of all human conduct. See TELEOLOGY. Now, in the speculative or theoretical sciences, *ultimate* principles cannot be proved; it is the nature of proof to rest one doctrine on some other doctrine, so that we must come at last to what is taken without proof; we cannot prove our present sensations; nor can we demonstrate that what has been will be; we must take these things for granted. And so it is with ultimate ends in the practical sciences: we cannot prove that each person should seek his own happiness; we must assume it as an ultimate fact, and trace the consequences. The final end of all conduct cannot be reasoned; it must be gathered from the actual conduct of men; we must find by observation what ends men actually pursue, and, if we can, generalise them into one comprehensive statement. The function of argument in the case is to shew where inconsistency has crept in, or to make professions accord with practice. Thus it is, that the supporters of Utility aver that men, even although refusing the theory, still proceed upon it in their conduct; and that the doctrine cannot be impugned consistently with the admitted motives of human action. Human beings, as a rule, have no other end in life but happiness, either for themselves or for others; and morality belies human nature if it does not accord with this universal object of pursuit.

Although Utilitarians hold that good and evil, right and wrong, are properly determined by a calculation of the consequences as regards human happiness, they do not all maintain that past or existing systems of morals have been on all points framed on this principle. Bentham and James Mill appear to have thought that the rule has always been kept in view, though often badly applied. But others, equally earnest in regarding it as the only legitimate rule, are of opinion that, in the past and existing ethical precepts, men have been guided partly by Utility, and partly by Sentiment—that is, liking or disliking for the act itself, irrespective of any further consequences. Thus, the veneration of the Hindu for the cow, on which ethical duties are founded, is an instance of sentimental liking; the Jewish and Mohammedan prohibition of the pig is a matter of sentimental dislike. In the ceremonial rites of ablution, so widely prevalent, there is a certain shew of Utility, mixed up with the fancy of cleanliness or purity. In the doctrine of the sacredness of kings, there is a combination of Utility and Sentiment.

The following are the chief objections to the utilitarian scheme, with the arguments in reply.

I. It is maintained that Happiness is not, either in fact or in right, the sole aim of human pursuit; that men actually, deliberately, and by conscientious preference, seek other ends. For example, virtue is an end in itself, to be sought whether it yield happiness or not, and even if it should be productive of the greatest misery. The qualification, however, is always added, that virtue, in the long run, without intending it, and all the more for not intending it, is the unfailing source of happiness.

To which the supporter of Utility answers:

1. It is quite true that men seek other ends than immediate happiness to themselves and to others, and that, in particular, they cultivate the virtues as ends in themselves, without always thinking of them as means to happiness. But, then, this is by the operation of a familiar law of the mind, whereby what was originally of the nature of means, comes at length to be valued as an end; such is the well-known case of the love of money. The virtues of justice and veracity are essential to human society, just as money represents the basis of subsistence; and by frequent association, the regard that we pay to the end is transferred at last to the means.

2. It may be shewn in many ways that the great social virtues derive their worth in our estimation from their subservience to human happiness, and not by any absolute title of their own. Take, first, Veracity or Truth, which, of all the moral duties, has most the appearance of being an absolute and independent requirement. A little consideration will shew that even this is not in our eyes an unlimited or unqualified virtue. Men have always approved of deception practised towards an enemy in war, to a madman, or a highway robber; also, secrecy or concealment, even although misinterpreted by others, is generally allowed—unless it leads to some pernicious results; while, if the divulgence of the truth were attended with harm, it would be universally reprobated. But an absolute standard of truth is incompatible even with secrecy or disguise; in departing from the course of perfect openness, or absolute publicity of thought and action, in every possible circumstance, we renounce ideal truth in favour of a compromised, qualified veracity—a following of truth only so far as is expedient.

Again, as regards Justice, the presence of considerations of Utility is equally obvious. There is no absolute rule of justice that does not bend to circumstances. If justice be defined, giving every one his own, or what he is entitled to, there is the show of an absolute rule; but, in reality, nothing is determined. The meaning is, to give to each what *law* and *custom* have declared to be a man's own. It is declared just for an elder son to receive a larger share of the parental estate than all the rest of the children put together; but it is clear that whatever justice there is in this, must be founded on some ground of expediency. (See on this subject, J. S. Mill's *Utilitarianism*, chap. v.)

II. It is further objected to the adoption of Utility as the standard of Right, that the full consequences of actions are too numerous, involved, and complicated to be reduced to calculation; and that even where the calculation is possible, people have seldom time to make it.

To this, it is answered, first, that the primary moral duties refer to conduct that can be fully calculated to the satisfaction of any reasoning mind. Thus, to revert to the two leading examples, Truth and Justice: the habitual disregard of these duties would soon bring a society to utter confusion and ruin; without them, there could be no social co-operation; man would fall below the condition of the gregarious animals; the race could hardly be saved from extirpation. On the other hand, the observance of these duties, in a high degree, raises to a corresponding degree the means of human happiness. The balance of advantages is all on one side—there is no case for the other side at all.

There have always been moral rules or enactments where the calculation of consequences was much less easy; for example, the indissolubility of

marriage is maintained in some countries, and not in others; and there have been considerable differences as to the forbidden degrees of affinity in marriage. In these usages, there are both advantages and disadvantages, and the preponderance is variously estimated by different calculators. In such cases, the utilitarian would say: Do not make a compulsory enactment restricting liberty, which restriction is an evil in itself, unless the balance of advantages is unquestionable and great.

As to the argument, that it is impossible to make the calculation of consequences every time we perform a moral act, the reply is, this is unnecessary; the calculations as to the various duties have been already made, and are embodied in rules, which rules we remember and apply without thinking of the process gone through in arriving at them. The navigator at sea does not need to compute the *Nautical Almanac* every time he determines his longitude; he carries it to sea with him ready for use.

III. A third objection is, that men in all ages have distinguished between the Right and the Expedient, that is, the Useful; the two are in most languages put in opposition or contrast. The reply is, that the Expedient, when thus opposed to the Right, commonly means what is expedient for the agent at the time, but is not expedient for people generally, or even for himself in the long-run. It is sometimes expedient, in this sense, to tell a lie, to rob, or to murder; but such actions are not expedient in the sense of general utility, or the greatest happiness of mankind.

It is further to be remarked in this contrast of the Expedient and the Right, that the Expedient may mean simply an addition to our conveniences or comforts, something that it is well for us to have, but that we might do without. Thus, it is highly expedient to possess cheap postage, railways, and electric telegraphs. On the other hand, the Right points to the essentials of our existence; without the fulfilment of contracts, respect to life and property, obedience to law, society would be dissolved. The distinction was expressed in one of Cromwell's speeches, by the contrast of a nation's Being and its Well-being; what secures the one is emphatically the Right, the promotion of the other is the Expedient. Right is the highest and most imperative form of Expediency.

IV. A fourth objection against the utilitarian scheme is, that all useful things are not made obligatory; it may be useful to have railways, but it is not a duty of every man to make them. But the utilitarian, while contending that nothing should be made a moral duty but what contributes to the happiness of mankind, does not hold the converse, that whatever promotes human welfare is a moral duty.

So much for the objections. The positive ground of Utilitarianism is, that men actually recognise happiness as their paramount consideration, or highest end. This, as a general rule, is too obvious to require proof. Each one's plan of life is principally made up of ideas of happiness to self or to others. All our good wishes to one another are repetitions of the one idea, 'May you be happy.' The seeming exceptions have been noticed above.

One of the strongest confirmations of the doctrine is derived from the usual inducements to right conduct, common to all moralists. We find that no one can preach morality without making use of its bearings upon happiness. The very meaning of the terms expressive of the highest virtues—love, goodness, mercy, compassion, fidelity, honesty, integrity, justice—is something that relieves the pains and augments the pleasures of sentient beings. To love is to make the object happier, and love is the fulfilling of the law.

Although there be duties occasionally imposed upon men that have no obvious tendency to increase happiness, but rather to diminish it, as the labours of some cumbrous ceremonial system like Hinduism, those duties have to be upheld by the fear of punishment or the hope of reward, still testifying to the predominating motives of the human mind. It is not, however, by reference to traditional observances that the happiness motive is most clearly tested. The proper plan, as remarked by Mr Samuel Bailey, is to try it upon some fresh case, some entirely new enactment, when it will be found that the interest or happiness of the community is the *sole* consideration appealed to. If a new law of inheritance is proposed, or a new government Board constituted, nobody advances any other criterion but expediency, or the good of certain persons now or in the future; unless such expediency can be shewn, no one will move in the matter at all; and the earnestness of the promoters will be in exact proportion to their sense of the resulting good. We may, through blind conservation, keep up usages not only destitute of utility, but productive of harm; but we should not now deliberately set up for the first time any practice that we did not regard as conducive to somebody's well-being. Traditional associations excepted, the strength of our approbation or disapprobation always follows our estimate of happiness or misery produced.

It is worthy of remark that Utility, or the promotion of human welfare, as it is the very meaning of the work of a public benefactor, expresses the sum of the labours of all the best men that have ever lived.

UTO'PIA (Gr. *ou*, not; and *topos*, a place, equivalent, therefore, to 'Nowhere') is the name given by Sir Thomas More (q. v.) to the imaginary island which he makes the scene of his famous political romance, *De Optimo Reipublicæ Statu, deque Nova Insula Utopia*, originally published in Latin, at Louvain, in 1516, and translated into English by Bishop Burnet. This island, which More represents as having been discovered by a companion of Amerigo Vespucci, is the abode of a happy society, which, in virtue of its wise organisation and legislation, is free from the harassing cares, inordinate desires, and customary miseries of mankind. More's romance obtained a wide popularity, and the epithet *Utopian* has since been applied to all schemes for the improvement of society which are deemed not practicable—e. g., to those of Saint-Simon (q. v.) and Fourier (q. v.) Everything, however, is not Utopian that is called such. All the great changes that have taken place in the world have had to pass through a 'Utopian' phase.

U'TRAQUISTS (Lat. *utraquistæ*, from *utrâque*—i. e., *specie*, in both kinds), a name at first given to all those members of the Western Church, in the 14th c., principally followers of John Huss, who contended for the administration of the Eucharist to the laity under both kinds; but in later times restricted to one particular section of the Hussites, although all the members of that sect alike claimed this as a fundamental principle of their church discipline. The name may be said to date from 1415, when the followers of John Huss, in Prague, and elsewhere in Bohemia, adopted 'the communion of the cup' as their rallying cry, and emblazoned the cup upon their standards, as th distinguishing badge of the association. In 1417, the university of Prague, by a formal decision, directed that all the laity should communicate in

both kinds; and the Council of Constance, in consequence, prohibited students from any longer resorting to Prague for the purposes of study. The Hussite party, on the contrary, made the demand one (the second) of the four points upon which they insisted as the condition of their submission to the church. Their demands were rejected by the Council of Constance; but the Council of Basel, in 1433, acceded to the demand for the cup, under the condition that, whenever communion was so administered, the ministering priest should accompany the ministration with a declaration that Christ was contained whole and entire under each species. A portion of the Hussite party was content with the explanation of this and the other points offered by the council, but the more violent held out. See Huss. The former were called U., and continued to be so designated. During the Reformation troubles, this division was still maintained. The U. were favourably regarded by the imperial party; and after the battle of Mühlberg, in 1547, they alone were formally tolerated in Bohemia and Moravia. One of the most celebrated leaders was Jacobus v. Mies. The name Utraquist is still applied to certain districts or villages in Bohemia and Moravia; but it is used not in reference to this theological controversy, but merely to convey that, in these villages or districts, *both languages*, Bohemian and German, are spoken.

UTRECHT, a province of the Netherlands, bounded on the W. by South Holland, N. by North Holland and the Zuider Zee, E. by Gelderland, and S. by the Rhine and Leck. It is 42 miles from east to west, and 21 from north to south. Superficial extent, 346,405 acres; 62,500 of which are arable, 180,000 pasture, 39,000 in wood, the remainder waste land and water. The chief places are Utrecht, Amersfórt, Rhenen, Wijk bij Duurstede, Montfórt, and Ijsselstein (pronounced I'sselstein). There are 86 country parishes. Pop. (1881) 197,638. Rather more than 36 per cent. are Roman Catholics; the remainder, except 1600 Jews, are Protestants.

The country is varied by beautiful hilly districts, level fields, orchards, tilled land, meadows, and moss. The hilly tract stretches from near Amersfórt to Rhenen on the Rhine, 21 miles. It is well wooded. Rye, oats, and buckwheat are sown; sheep, cattle, and bees extensively kept. To the south of this belt is rich clay land, producing excellent wheat and barley. Near Amersfórt and Rhenen, tobacco is largely planted, the crop of 1865 being 948,750 lbs. The stock amounted to 12,771 horses, 76,989 horned cattle, 32,997 sheep, 20,547 swine, 4678 goats, and 13,835 bee-hives.

U. is watered by the Rhine, Vecht, Leck, Amstel, Grebbe, and many other rivers. The inland fishing is trifling; but many herrings, eels, flounders, anchovies, &c., are taken in the Zuider Zee. Besides agriculture, the industries are soap-boiling, sawing wood, copper and iron founding, making machinery, carpets, tiles, bricks, coarse pottery, cement, &c. There are many beautiful country-seats, the climate being dry and healthy.

UTRECHT (*Ultrajectum* or *Trajectum ad Rhenum*), the provincial capital, is beautifully situated in the midst of a district composed of sandhills, woody heaths, rich grassy meadows, extensive orchards, flower-gardens, and cultivated fields. It ies 24 miles south-east from Amsterdam. Pop. (1884) 74,365; births during the year 1865, 2301; deaths, 1538. The broad walls have been levelled, planted with trees, and formed into beautiful and well-kept promenades.

U. is favourably situated for trade, being the point from which several railways radiate, and having excellent water-communication by the Old Rhine and the Vecht. The staples are grain, cattle, and various manufactures. It is the residence of many noble families, the seat of a university, national veterinary school, national hospital, high military court, the mint, &c. Principal buildings are the cathedral or Domkerk, the town-house, the mint, the university, and several handsome barracks for the infantry and cavalry, especially the Willems-kazerne. The cathedral was consecrated to St Martin about 720. In 1674, a hurricane destroyed the body of the building between the choir and the tower, so that the latter is now isolated. It is 321 feet in height.

In 1864, the students of theology numbered 187, law, 210; literature, 14; medicine, 63; philosophy, 31. A good library is attached to the university. There is a national school, for military surgeons; a grammar-school; normal school for teachers; a musical college, for elementary singing, the piano, and violin; a historical society; meteorological institute; medical society; pharmaceutical society, &c. Education generally stands high.

The charitable institutions are numerous. Principal industries are—manufacturing tobacco and cigars, woollen fabrics and carpets, making salt, furniture, baskets, tin, copper, and silver work, sawing wood, rope-making, iron-founding, book-printing, &c. The royal cigar factory alone makes 40,000 daily.

U. is one of the oldest cities of the Netherlands, and probably was founded by the Romans. Here the famed union of the northern provinces for the defence of political and religious freedom was formed January 23, 1579. For a short time in 1807, Louis Napoleon, king of Holland, resided in Utrecht. It has been the birthplace of many distinguished men, among others Pope Adrian VI., in 1459.

U. has acquired a degree of celebrity for the treaties there concluded, which brought to a close the war of the Spanish Succession. See Succession Wars. After this disastrous conflict had endured for more than ten years, Great Britain, finding that the reasons which had prompted her to engage in it no longer existed, tried to induce Austria to come to terms with France, but failing in this, at once signed private preliminary articles for herself, October 8, 1711. On January 12, 1712, a congress was opened at U.; and France, desirous, at almost any price, of detaching Britain from the grand alliance, voluntarily made so many concessions, that the latter had only further to demand the banishment of the elder Pretender, whose sojourn in France had been a source of disquietude, the conclusion of a treaty of commerce, and indemnities for her allies—all which points were at once conceded. But the preposterous demands of Austria, which included not only the renunciation by the Bourbons of the entire Spanish Empire, but the restoration of all those places which had been ceded to France by the treaties of Münster, Nimeguen, and Ryswick, and the retention of all Austria's conquests in Italy, the Low Countries, and Spain, forced the French to break off the conferences, in the hope of making a separate peace with Britain, and compelling the other allies, by negotiation or arms, to lower their pretensions. This plan was successful; agreement on all points at issue was established betwee France and Britain in August 1712; and arrangements were also come to with Holland, Portugal, Prussia, and Savoy soon afterwards. As each of the contracting parties negotiated in its own name, no fewer than nine distinct treaties of peace were

signed in the following spring, 11th April 1713. By the treaty between France and Britain, the former ceded St Kitt's, Hudson's Bay, Nova Scotia, and Newfoundland (the liberty of fishing for cod being reserved), recognised formally the reigning dynasty and the Hanoverian succession, agreed to demolish the fortifications of Dunkirk, engaged that the crowns of France and Spain should never be united, and that no part of the Spanish Netherlands should ever be ceded or transferred to France; and Spain renounced her Italian possessions in favour of Austria, and gave up Gibraltar and Minorca to Britain, with which power she also concluded the *Assiento* (q. v.) treaty. The chief of the special agreements with the other contracting parties were as follows: Ypres, Knocke, &c. to be exchanged with Holland for Douai, Bouchain, &c., and a treaty of commerce to be concluded; both banks of the Amazon to belong to Portugal; Spanish Gelders, and the district of Kessel, to be ceded to Prussia, and its ruler's title of king, assumed in 1701, formally recognised, Prussia in turn resigning all claims to the principality of Orange; the Duke of Savoy to obtain Sicily, with the title of king, &c. The treaty of U. did not make peace with Austria and the German Empire; but in the following year, at Rastadt and Baden, they agreed to substantially the same terms as were proffered at Utrecht. The electors of Cologne and Bavaria, who had been put under the ban of the empire, were restored; Sardinia, granted to Bavaria at U., was restored to Austria; Austria renounced her claims to the Spanish succession; the cession of the Spanish possessions in Italy was confirmed; Brisach and Freiberg, in the Breisgau, were also given to Austria; the highest ridge of the Maritime Alps was made the boundary between France and Savoy; and on failure of the Spanish Bourbons, the crown of Spain was to fall to the House of Savoy.—See Lord Mahon's *History of the War of Succession in Spain* (Lond. 1832).

UTRE'RA, an old town of Spain, in the province of Sevilla, and 18 miles by railway south-east of the city of that name. In early times, it was flourishing and populous; but fell into a state of stagnancy, from which it has begun to revive, along with the rest of Spain. It is important as a military post, contains a beautiful Gothic church, a Moorish castle, and cavalry barracks. The streets and promenades are kept clean and fresh by streams of running water. U. contains upwards of 13,000 inhabitants, mostly agriculturists engaged in the productive estates which surround the town. Corn, wine, oil, and fruit are produced. Sheep and cattle, as well as a breed of fierce bulls, are reared in the vicinity.

UTTERING COUNTERFEIT COIN is an offence punishable with one year's imprisonment with hard labour. The punishment is increased if, besides uttering, the person has other counterfeit coin in his possession. It is also an offence to utter false foreign coin as the Queen's coin or as foreign coin.

UTTO'XETER, a market-town of Staffordshire, on an eminence above the vale of the Dove, 16 miles north-east of Stafford. A church with an ancient tower and lofty spire is the only noteworthy building. There are two large breweries in the town, with a rapidly increasing business.

U'VULA. See PALATE.

U'XBRIDGE, a market-town in the county of Middlesex, on the Colne, 15 miles west of the city of London. Pop. (1881) 7712. Its corn-market is one of the most important in the kingdom.

V

V THE twenty-second letter in the English alphabet, is derived directly from the Lat. character *v*, which represented originally both the consonant *v* and the vowel *u* (see U). The name of the letter is derived from the Phœnician and Hebrew *vau* (signifying a nail, which the form of the letter originally resembled), which stood sixth in the alphabet, and became the Digamma (q. v.) of the Old Greek, and the *f* of the Latin (see F). The Greek υ (see ALPHABET), from which the Lat. *v* is taken, had, in the classical period, degenerated into a sound like the French *u*, and in modern Greek is undistinguishable from *i*. The Greeks, after they had lost the digamma, represented Lat. *v* by ου or β; e.g., Ουαρρων or Βαρρων = Varro, Βιργιλίος = Virgilius. In the beginning of Latin words, *v* must have had a consonantal sound approaching that of *v* in English, as is inferred from its persistence as compared with the Greek digamma; e. g., Vinum = (Ϝ)οἶνος, Vesta = Ἑστία. Between two vowels, on the contrary, it was often dropped out, as in *nuper* for *novumper*, *Jupiter* for *Jovipiter*, *prudens* for *providens*; from which we may conclude that it had in that position the power of a semivowel, like Eng. *w*. In New High German, *v* takes the place of Gothic and Eng. *f* (see F), and is pronounced like *f*, while the *v*-sound is expressed by *w*.

VAAL RIVER, the Dutch name of one of the most important branches of the Gariep or Orange River, and signifying yellow, from the colour of its waters when in flood, its Hottentot name, Ky Gariep, having really the same signification; the Betjuans call it Namagari. It rises in the Mount of Sources, at the north-west angle of Natal, and running a very circuitous course of about 500 miles, forming the boundary between the Orange River Free State and the Transvaal Republic and Betjuana tribes, it joins the other great branch, the Nu Gariep or Orange River, in lat. 29° 10′ S., long. 24° 28′ E.

VACATION, in Legal language, means the holiday usually enjoyed by lawyers in consequence of many of the courts being closed, and thereby some steps in a suit not being competent during part of the autumn of each year. There are short vacations during other parts of the year; but the long vacation is that which extends from 10th August to 24th October, and during that part of the year it is usual for legal business to be in great measure suspended.

VACCINATION is the process by which a specific disease, termed *vaccinia*, or cow-pox (from the Latin word *vacca*, a cow), is introduced into the human organism with the view of protecting it against an attack of an incomparably more severe disorder—viz. smallpox. For the history of this remarkable discovery of vaccination—'that masterpiece of medical induction'—we must refer to the life of Jenner (q. v.). In his *Inquiry into the Causes and Effects of the Variolæ Vaccinæ*, published 1798, he establishes the following facts: (1.) That this disease casually communicated to man has the power of rendering him unsusceptible of smallpox; (2.) that the specific cow-pox alone, and not other eruptions affecting the cow, which might be confounded with it, had this protective power; (3.) that the cow-pox might be communicated at will from the cow to man by the hand of the surgeon, whenever the requisite opportunity existed; and (4.) that the cow-pox once ingrafted on the human subject, might be continued from individual to individual by successive transmissions, conferring on each the same immunity from smallpox as was enjoyed by the one first infected direct from the cow.

The *method of vaccinating* and the *phenomena of cow-pox*, as observed in the human subject after vaccination, claim our first and chief attention. Except under circumstances of special risk (as, for instance, where smallpox is in the neighbourhood), children should only be vaccinated when they are in apparently good health. Diarrhœa and skin-diseases are especially to be avoided; and it is important to see that there is no chafing behind the ears, or in the folds of the neck or groin. As more than one-fourth of the whole number of deaths from smallpox in England during the six consecutive years 1856—1861, took place in children of less than one year, it is obviously expedient that children should be vaccinated in very early infancy, provided health permits. Dr Seaton, in his comprehensive article on this subject in Reynold's *System of Medicine* (1866, vol. i. p. 489), observes that 'plump and healthy children living in large towns should be vaccinated when a month or six weeks old; in more delicate children, the vaccination might be postponed till they are two or three months old; but all, except those whose state of health positively contra-indicates vaccination, should be vaccinated by the age of three months.' This early age has also the advantage of being free from the irritation of teething.

The lymph to be used should always be taken from a healthy child, and from thoroughly characteristic vesicles; and when lymph in all respects satisfactory cannot be procured, as is often the case in country districts, the operation should be postponed. Lymph is usually taken when the vesicle is fully formed, which is usually about a week after vaccination; if it is not taken till the areola (which will be presently described) is complete, its protective power is far less certain. 'Prime lymph,' says Dr Seaton, 'has always a certain degree of viscidity; and a thin serous lymph, even from a vesicle which is not advanced, is to be avoided. Babies are much better lymph-givers than elder children or adults and children of dark complexion, not too florid, with a thick, smooth, clear skin, yield the finest and most effective lymph.' Lymph should always, if practicable, be passed direct from arm to arm; and preserved lymph should only be had recourse to when a vaccinated child cannot be obtained. A

good vesicle freely punctured on its surface exudes enough lymph or vaccine matter for the direct vaccination of five or six children, and for charging six or eight ivory points for future emergencies. The process of vaccination consists essentially in introducing the lymph into the structure of the true skin, or in bringing it in contact with the absorbing surface. This may be effected in various ways, one of the most common being by puncture. As the operation is extremely simple, and the knowledge of the mode of performing it may prove useful to many of our readers, we shall briefly describe it. The skin on the outside of the arm, below the shoulder, should be held upon the stretch, and a very sharp, clean lancet, well charged with lymph, should be made to puncture the skin from above downwards, at an angle of about 45°, and be made just to enter the true skin. The matter thus inserted is retained by the valvular character of the puncture and the elasticity of the skin. In this form of the operation, not less than five or six such punctures should be made, at a distance of half an inch from the other; and for the sake of security, three punctures may be made on each arm. If the lymph is preserved on points, each point, after being held in the steam of hot water so as to dissolve the lymph, should be inserted into the punctures made by an ordinary lancet. Some surgeons make a number of minute superficial punctures over a patch of the size of a fourpenny-piece, and spread the lymph over this spot with the flat part of the lancet: this kind of tattooing should be repeated on three spots. Others make a number of parallel scratches, or crossed scratches, with a charged lancet; and others, again, use special scarifiers or rakes, consisting of three or four needle-points inserted in an ivory handle, and drawn either once or again at right angles over the tense skin, the lymph being then plastered over the scarified surface. Of these various plans, Dr Seaton believes that the best marks and most successful treatment result from this last plan of cross-scratches. A far better plan of preserving lymph than that of drying it on points, is that of preserving it in a fluid state in Husband's closed capillary tubes, in which form it is ready for use without any preparation. When the operation is successfully performed, the skin at the spot becomes slightly elevated, hard, and red, on the third or fourth day; on the fifth or sixth day, a vesicle of a bluish-white colour forms, which presents an elevated edge and a depressed cup. It is distended with clear lymph, and attains its perfection on the eighth day; and now, or on the ninth day, the vesicle is surrounded by an inflamed ring or areola; on the ninth, tenth, and eleventh days, the vesicle becomes a pustule, the cupped form disappears, the areola enlarges till it becomes a circle, with a diameter of from one to three inches. On the twelfth, thirteenth, and fourteenth days, the pustule dries up; and in the course of the next week, the scab separates and falls off: it seldom remains so long as the twenty-fifth day. It leaves a cicatrix, which commonly is permanent in after-life, circular, somewhat depressed, dotted or indented with minute pits, and in some instances radiated. The establishment of the areola is accompanied with constitutional disturbances, as indicated by restlessness and heat of skin, frequent derangement of the stomach and bowels, and occasional swelling of the glands of the armpit. These symptoms are seldom severe, but seldom quite absent. We occasionally meet with cases in which the course of the above symptoms is modified, as when they are simply retarded, or simply accelerated, or altogether irregular and spurious; and it should be carefully borne in mind that 'a vaccination presenting any deviation from the perfect character of the vesicle and the regular development of the areola, is not to be relied on as protective against smallpox.'—Seaton, *op. cit.* As a general rule, neither the local nor the constitutional symptoms of ordinary vaccination require any treatment.

From recent investigations, conducted by order of the government, and published in several of the *Reports of the Medical Officer of the Privy Council*, it appears that amongst the poorer classes, vaccination is often so imperfectly performed as to leave no mark, and to exert no protective power. Mr Marson of the Smallpox Hospital believes that with good lymph, and the observance of all proper precautions, a good vaccinator should not fail of success in his attempts to vaccinate above one in 150 cases; while Dr Seaton puts one failure as a fair proportion in 170 cases.

The official inquiries above referred to, in the course of which the arms of nearly half a million vaccinated children were examined, prove, says Dr Seaton, who was employed in the investigation, the great extent to which imperfect or insufficient vaccination has obtained: taking the country throughout, not more than one child in eight was found to be so vaccinated as to have the highest degree of protection that vaccination is capable of affording; and not more than one in three could, on the most indulgent estimate, be considered as well protected. The main causes of this imperfect success were the following: '(1.) The frequency with which practitioners, instead of attempting fully to infect the system, had been satisfied with insertions of lymph sufficient to produce only one, two, or three ordinary vesicles; (2.) the want of due attention to the *selection* of the lymph used in vaccinating; (3.) carelessness and clumsiness in the performance of the vaccination, so that, if the operation did not wholly fail, it very frequently resulted in a less degree of effect than it had been the aim of the operator to produce; and (4.) the great and unnecessary extent to which the use of preserved and conveyed lymph was substituted for vaccination direct from the arm.'—Seaton, *op. cit.*, p. 503. The following observations made by Drs Buchanan and Seaton during the epidemic of smallpox in London in 1863, on upwards of 50,000 children in various national and parochial schools, workhouses, &c., are of such extreme importance that we make no apology for inserting them. Some of the children had never been vaccinated; the large majority had been vaccinated in various manners and degrees. Of every 1000 children without any mark of vaccination, no fewer than 360 had scars of smallpox; while of every 1000 children who had evidence of vaccination, only 1·78, on an average, had any such traces: and with regard to the quality and amount of the vaccination, it was found that, of children having four or more cicatrices, only 0·62 per thousand had any trace of smallpox; while of those who had a single bad mark, 19 per thousand were scarred by smallpox. Hence the best vaccination was more than thirty times as protective as the worst, and the worst was more than forty-seven times better than none at all. The importance of the completeness of the vaccination, as shewn by the cicatrices, is also well shewn by the results obtained by Mr Marson. From the study of more than 15,000 cases at the Smallpox Hospital, he finds that while the unvaccinated died at the rate of 37 per cent., the vaccinated have died at the rate of only $6\frac{1}{2}$ per cent.; the mortality amongst those with four or more scars being only 0·55, while that amongst those with only a single scar was 7·73 per cent.; so that, while the average risk which vaccinated

persons run if they do catch smallpox is about one-sixth of the risk run by unvaccinated persons, well-vaccinated persons run less than one-seventieth part of the risk. It must further be borne in mind, that while few unvaccinated persons do not at some period of life sustain an attack of smallpox, the cases are comparatively rare in which a well-vaccinated person catches the disorder; so that the protective power of vaccination shews itself in two ways—viz. (1.), in shielding the constitution, in the great majority of cases, from any kind of an attack of smallpox; and (2.) in the exceptional cases, of so modifying the disease, as almost invariably to deprive it of danger to life, or of those terrible disfigurements which the unmodified disease so frequently left behind it.

Whether the protective power of vaccination lasts through life, or, as many physicians hold, gradually wears out in a certain number of years, is still an open question. It is, however, the safer course to adopt the second view, and to re-vaccinate at intervals (every seven years, for instance), especially after the evidence that has been adduced of the imperfect way in which the operation is often performed. Dr Seaton adopts a medium course, and holds that 'one thoroughly good primary vaccination to start with, and one careful re-vaccination after puberty, are all that is necessary for the complete protection of the population against smallpox.' Even in those who had good scars, the second operation is often more or less successful. Thus, in 13,861 cases in which re-vaccination was performed in the Würtemberg army, the operation was quite successful in 31 per cent., partially so in 28 per cent., and totally failed in 41 per cent.

Much has been written regarding the *dangers of vaccination;* and the well-known Rivalta case, in which an infant thus communicated syphilis to a whole population in a remote district of Piedmont (see SYPHILIS); and the recent death of a distinguished middle-aged baronet from (as it was alleged) vaccination with impure lymph, have recently directed special attention to the subject. See Mr Simon's *Papers relative to the History and Practice of Vaccination;* and Dr Henry Blanc's *Human Vaccine Lymph and Heifer Lymph compared.* The latter asserts that a kind of skin disease and syphilis have been unmistakably transmitted by vaccination. Other practitioners assert that blood-poisoning in vaccination is due to the inlet of organic particles from the atmosphere.

The relations between smallpox in man and cow-pox in the cow, claim a passing remark. Jenner believed that they were essentially the same disease, and that they had a common origin in the grease of the horse. Various experiments have been made to inoculate healthy cows with smallpox, and those of Mr Ceely of Aylesbury in 1839, and of Mr Badcock of Brighton in 1840, who induced vesicles by inoculating cows with smallpox virus, and thus obtained a supply of genuine vaccine lymph, place the identity of the diseases beyond all question. The disease really known as grease appears to have nothing to do with cow-pox or smallpox; but the horse occasionally suffers an affection which is precisely the same as the smallpox in man and the cow-pox in cows; and the lymph from this horse-pox has been successfully used for vaccination.

In conclusion, a brief paragraph must be given to the legal bearings of the question. In 1841, the Vaccination Act was passed, which made the practice of inoculating with smallpox virus unlawful. In 1853, another act, known as Lord Lyttelton's Vaccination Act, was passed, with the view of rendering the practice of vaccination compulsory. This act, although useful as far as it goes, has, however, proved inefficient, and it was hoped that an amended Bill, before the Houses in the spring of 1866, would have been carried. The Public Health Act, passed in 1858, gives to the Privy Council the power of issuing such regulations as they may think fit for securing the due qualification of persons to be contracted with for the vaccination of poor persons resident in unions and parishes, and for securing the efficient performance of vaccination. One of the most important indirect results of this power in their hands is the appointment of *public vaccinators,* to give instructions in all the practical points bearing on vaccination, and in fit cases to give certificates of proficiency. They have, moreover, made arrangements for supplying lymph, guaranteed by the National Vaccine Board, to all medical practitioners who apply to 'The Registrar of the National Vaccine Establishment, Privy Council Office, London, S.W.'

VACCINIA'CEÆ, a natural order of exogenous plants, differing from *Ericeæ* chiefly in having an inferior ovary and succulent fruit. Many botanists make it a section of *Ericeæ.* About 200 species are known, natives of temperate climates, in all parts of the world, but chiefly in the northern hemisphere. A few species, remarkable as being parasitic, are natives of Peru. The V. are shrubs, and rarely small trees, with numerous round or angular branches, simple leaves on very short stalks, and flowers solitary or in racemes. Whortleberries (q. v.) and Cranberries (q. v.) are the most familiar examples of the order.

VÂCH (literally, speech) is another name of Saraswatî (q. v.), the female energy of the Hindu god Brahman.

VÂCHASPATI (literally, 'lord of speech,' from the Sanscrit *vâch*, speech, and *pati*, lord) is, in Hindu Mythology, one of the usual names of *Vr'ihaspati* (q. v.), the instructor of the gods.

VA'CUUM literally means empty space, or space wholly devoid of matter. From Aristotle to Descartes, metaphysical speculators took the question into their own hands, and, of course, wrote nonsense about it. Thus, Descartes commits the absurdity of saying that, if a vessel be perfectly empty, its sides must be in contact—confounding the totally distinct ideas of *matter* and *space.* The dictum that *nature abhors a vacuum,* was employed to account for the rise of water in pumps; but it was presently found that nature did not abhor a vacuum through more than an elevation of about 32 feet. See TORRICELLI. When the subject was taken up by its legitimate owners, the experimental philosophers, such absurdities disappeared, but real difficulties were detected. So far as experiment has yet guided us, we may assert that vacuum cannot exist. The interstellar spaces, though probably devoid of ordinary ponderable matter, or at best only occasionally visited by it, are certainly pervaded by the luminiferous medium. See ETHER, UNDULATORY THEORY. That this is Matter (q. v.), is amply proved by the effects of its vibrations on the eye, and by the resistance which it has been discovered to oppose to the motion of Encke's comet. It is not merely for the propagation of light and heat that we are forced to assume that the universe is a *plenum;* Newton expressly said (see FORCE, where the quotation is given at greater length) 'That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a *vacuum,* without the mediation of anything else, by, and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent

faculty of thinking, can ever fall into it.' Nothing could be stronger than this; and we have, in addition, the results of modern observation, which shew a connection between sun-spots, planetary configurations, and terrestrial magnetism, obviously requiring some material channel to exist between the sun and its secondaries. Faraday's electrical discoveries tend to the same conclusion.

But, in ordinary language, a vacuum is said to be produced (more or less *perfect*) when ordinary ponderable matter, such as air, is more or less completely removed from the interior of a closed vessel. Till the commencement of the present century, the most perfect vacuum that could be obtained was what is called the Torricellian vacuum—i. e., the space above the mercury in a carefully filled barometer tube. Such a vacuum, however, is almost useless for experimental purposes, and, besides, it contains mercurial vapour.

A suggestion of Davy's, recently re-invented and greatly improved by Andrews, gives the means of procuring a much more perfect vacuum than the Torricellian. An ordinary air-pump removes all but about the $\frac{1}{120}$th of the gas in the receiver—i. e., produces a vacuum of about $\frac{1}{4}$th inch, as it is called. But if the gas employed be carbonic acid, admitted and pumped out several times, so as to get rid, as far as possible, of the last trace of air, the remaining gas will be almost wholly taken up by means of moistened caustic potash previously placed in the receiver. Concentrated sulphuric acid should also be present, to desiccate the potash when it has done its work. In this way, Andrews easily obtained a vacuum of about $\frac{1}{4600}$th of an inch, which remained unchanged for a fortnight. Here all but $\frac{1}{135,000}$th of the air had been removed. Farther improvements, devised by Frankland, Gassiott, and others, have been made in this process, especially for the production of (so-called) vacuum-tubes for the study of electrical discharges; and the exhaustion has been sometimes carried so far that the attenuated matter remaining was unable to conduct the discharge of an induction-coil.

VA'GRANTS, or TRAMPS, a class of beggars, many thousands in number, who, having their headquarters in the large towns of England, wander about the country, subsisting upon charity and plunder. In England, the spirit of the laws and still more public opinion have always been averse to putting restraints upon the inclinations of even viciously disposed persons, and, consequently, the country has never been without a class of habitual vagrants—beggars and pilferers by profession. But there is reason to believe that the number of these social pests has, for many years past, been declining, absolutely, as well as relatively to population. The statute-book has long contained laws against vagrancy, but they have never been systematically executed. The severest of the early laws were directed against the gipsies—at one time a really formidable class of vagrants—and against wandering soldiers and marines, and persons pretending to be discharged soldiers and marines. Such vagrants were made liable to the punishment of felony. The vagrancy laws are now comprised in the acts 5 Geo. IV. c. 83, and 1 and 2 Vict. c. 38, supplemented to some extent by provisions contained in local police acts. Those statutes (using the descriptive phrases of previous enactments) made idle and disorderly persons—that is, persons able, in whole or in part, to maintain themselves and their families, and neglecting to do so—liable to one month's imprisonment and hard labour; rogues and vagabonds (habitual vagrants and persons suspected of living by crime), liable to three months' imprisonment and hard labour; and a third class, described as incorrigible rogues, liable to be committed for trial at the Sessions, to be kept to hard labour in the interim, and after conviction, to be sentenced to one year's imprisonment and hard labour, with whipping in the case of males. The police have authority to enter houses of reception for travellers, and to arrest persons suspected of falling under any of the above-named descriptions, and carry them before a magistrate for trial. But between the difficulty of finding satisfactory evidence of the character of persons thus found wandering, the commendable fear of making mistakes, the popular feeling that vagrancy is not a crime, and the unwillingness of magistrates to add to the expense of prison establishments, the statutory powers have never been used to such an extent as to affect the prevalence of vagrancy.

On the other hand, a direct and material support has been given to vagrancy by the arrangements which, under the new poor-law, now exist in most districts for the relief of the travelling poor. In almost every union workhouse in England there is a casual ward, intended for poor artisans and labourers making their way, as they sometimes have to do, from places where work is slack to places where it is plentiful. The casual ward has been taken possession of by the vagrant, for whom the law provides only a prison-cell. From two-thirds to three-fourths of its occupants are usually habitual vagrants. Here the vagrant gets his supper, his bed, and in most cases his breakfast. The fare is exceedingly meagre—a little bread, with occasionally a bit of cheese, or a small quantity of skilley (gruel); and the sleeping accommodation is usually worse than that of the lowest lodging-houses—cleanliness being impossible with such occupants, and there being no desire to give them comfort. But the vagrant gets supplies of food in his wanderings by begging and plundering; and he seeks the casual ward chiefly for the shelter and the society. In 1848, Mr Charles Buller, then President of the Poor-law Board, prescribed a set of rules, which for a time almost deprived the vagrant of this resource. Relief was to be refused to all able-bodied young men unless they produced passes or certificates declaring their character from a clergyman or some person in a public position, or unless the workhouse officials were satisfied they were actually destitute; orders for the casual ward were to be given only by the police—whom the tramp regards as his natural enemies; and a suitable task of work was to be exacted from every person relieved. But these rules were soon withdrawn. In a good many cases, the police are still employed to give away the orders, and on the whole with advantage; but passes (this was the really valuable regulation) are not required; and in not a few cases, no task of work is exacted, because the poor-law guardians found that they lost money upon the work done by vagrants. In other cases, an option is given to the tramp of doing a certain amount of work, or going away in the morning without his breakfast. He almost always prefers the latter alternative. But, in general, about three hours' work is imposed; and when the workhouse authorities insist upon it, the vagrants usually—though greatly disliking work—comply with this condition.

By far the greatest number of the vagrants are men between the ages of 20 and 40, the average age being about 34. There is a small proportion of men above 40, and about an equal number of youths under 20—mostly runaway apprentices. About a fourth or a fifth are women, who are generally travelling with male vagrants; but the life seems to be too hard for women. The men often pretend to be going about in search of work, but seldom or never do work; and the majority of the vagrants

are of the class who, from mental constitution, would almost die rather than work. They are, besides, it must be added, persons whom decent labourers would not allow to be associated with them. Many of them have been brought up in workhouses; others are deserters from the army, or discharged soldiers of bad character; not a few are dissipated broken-down workmen, who, while tramping about in search of work, have acquired the tramp's bad habits and love of idleness. Many of them have been brought up to crime, but want the skill and daring necessary to success in their profession. They often make some pretence of occupation, under cover of which they approach houses to beg, or steal, or bully unprotected women. They are vendors of steel-pens, paper, laces; tinkers, china-menders, umbrella-repairers, ballad-singers. They are much given to small thefts; most of them are believed to be capable of any crime; but in fact they attempt few serious crimes. They are poor timid creatures, and feel that society with its police is too strong for them. They never unite together to commit crimes, but occasionally 20 or 30 of them, operating in twos and threes, work a district in concert. There is a free-masonry among them; and any new rule adopted at a workhouse becomes known in two or three days over a wide district. They are usually known by slang names; their language is horribly blasphemous and obscene; and neither men nor women have the smallest regard for decency, or any conception of sexual restraints. They give a great deal of trouble at the workhouses—swearing at and threatening the officials, occasionally stabbing them, refusing to do the allotted work, and not unfrequently tearing up their clothes, in the hope that the officials, out of regard to decency, will supply them with others. The officials can only threaten them with the magistrate and the jail; but sometimes—and it is then they are most insolent and troublesome—they have a desire for rest and regular feeding, and are not unwilling to go to jail. It is hard to understand what are the enjoyments of their wandering and shifty life. Apparently, the freedom of it and the immunity from work are its chief attractions. They have been well described as wandering about 'ready for any crime, but not planning crimes, quite ready to rob, but very much afraid of large dogs, very courageous against unprotected women, but skulkers when a broad-shouldered labourer turns his eyes their way, with no purpose except wandering, no restraint except hunger, no hope except of getting drunk upon some lucky haul, nomads in the midst of civilisation, simple savages without savage resources.' The revival of the regulations prescribed by Mr Buller, and the steady enforcement of the vagrancy laws—which should also be made more severe—are the measures most likely to put down vagrancy. There is no offence against society for which penal servitude would be a more appropriate penalty.

VAIR. See HERALDRY.

VAIS'ESHIKA is the name of one of the two great divisions of the *Nyâya* (q. v.) school of Hindu philosophy, and probably a later development of the Nyâya itself, properly so called, with which it agrees in its analytical method of treating the subjects of human research, but from which it differs in the arrangement of its topics, and more especially by its doctrine of atomic individualities or *vis'eshas*—whence its name is derived.

The topics or categories (*padârthas*) under which *Kan'âda*, the founder of this system, arranges his subject-matter, are the following six: (1) substance, (2) quality, (3) action, (4) generality, (5) atomic individuality, and (6) co-inherence; and later writers of his school add to these a seventh category, viz., non-existence. 1. Substance is the intimate cause of an aggregate effect; it is that in which qualities abide, and in which action takes place. It is ninefold, viz., earth, water, light, air, ether, time, space, soul, and *manas*, or the organ of affection. 2. Quality is united with substance; it comprises the following 24: colour, savour, odour, feel, number, dimension, severalty, conjunction, disjunction, priority, posteriority, gravity, fluidity, viscidity, sound, understanding, pleasure, pain, desire, aversion, volition or effort, merit, demerit, and self-restitution. 3. Action consists in motion, and abides in substance alone. It affects a single, that is, a finite substance, which is matter. Action is either motion upwards or motion downwards, or contraction or expansion, or motion onwards. 4. Generality abides in substance, quality, and action. It is of two kinds, higher and lower—genus and species. 5. Atomic individuality resides in eternal substances, by which are meant the organ of affection, soul, time, space, ether, earth, water, light, and air; it is the ultimate difference, technically called *vis'esha;* such differences are endless; and two atoms of the same substance, though homogeneous with one another, differ merely in so far as they exclude one another. 6. Co-inherence, or perpetual intimate connection, resides in things which cannot exist independently from one another, such as the parts and the whole, quality and the thing qualified, action and agent, species and individual, atomic individuality and eternal substance. 7. Non-existence, the last category, added to the foregoing by the modern Vais'eshikas, is defined by them as being either non-existence, which is without beginning, but has an end—as that of a jar, which did not exist until its antecedent non-existence ceased when being formed out of the clay; or non-existence, which has a beginning, but no end—as that of a jar which is smashed by the blow of a mallet; or absolute non-existence, which, extending through all times, has neither beginning nor end—as when it is said that a jar is not on the ground; or mutual non-existence, which is the reciprocal negation of identity—as when it is remarked that a jar is not a piece of cloth. The nature of each of these substances, qualities, actions, &c. is, then, the subject of special investigation. Thus, *earth* is said to be that of which the distinguishing quality is odour; it is described as being of two kinds: eternal, in its atomic character; and uneternal, when in the shape of some product. Again, products are defined as either organised bodies of five sorts, or organs of perception, or unorganic masses, such as stones, &c. Amongst the qualities, colour is defined as that quality which is apprehended only by the sense of sight; which resides in earth, water, and light; which is distinguishable in earth as white, yellow, green, red, black, tawny, and variegated; in water, as white, but not resplendent; in light, as white and resplendent, &c. *Self-restitution*—to give another instance of the definition of the qualities—is described as threefold: as impetus, the cause of activity in earth, water, light, air, and the organ of affection; as the mental process peculiar to the soul, which is the cause of memory; and as elasticity, in mats and similar substances, which causes an altered thing to reassume its former position.

Though this cursory statement must here suffice to give a general idea of the Vais'eshika system, it is worthy of especial notice that, according to it, understanding is the quality of *soul*, and the instruments of right notion are treated of under the head of 'understanding (*buddhi*).' Kan'âda admits of only two such instruments, or *pramân'as*, viz.

knowledge which arises from the contact of a sense with its object, and inference. Comparison, revelation, and the other instruments of right notion, mentioned in other systems, the commentators endeavour to shew are included in these two. Fallacies and other modes of inconclusive reasoning are further dealt with in connection with 'inference,' though with less detail than in the Nyâya, where these topics are enlarged upon with particular predilection.—The reputed founder of the V. is *Kan'âda*, which name the native authorities derive from *Kan'a*, minute, and *âda*, eating, and sometimes, therefore, also change into *Kan'abhuj* or *Kan'abhaksha* (*bhuj* and *bhaksha* being synonyms of *âda*). Nothing, however, is known as to the history or date of this personage, as they are involved in the same obscurity which covers most of the renowned writers of ancient India. His work is divided into ten *adhya'yas*, or books, each of which is subdivided into two diurnal lessons; these, again, being subdivided into sections containing two or more *Sûtras* (q. v.), or aphorisms, on the same topic. Like the Nyâya-Sûtras, the work of Kan'âda has been commented upon by a triple set of commentaries, and popularised in several elementary treatises. The text with the commentary of *S'ankara Mis'ra*—who is not to be confounded with the celebrated Vedânta author—has been edited at Calcutta in 1861 by the Pan'd'it Jayanârâyana Tarka Panchânana, who added to it a gloss of his own; and some of the Sûtras have been translated by the late Dr Ballantyne (Mirzapore, 1851). Of later works on the same system, may be mentioned the *Bhâshâparichchheda*, edited, with the commentary called *Siddhântamuktâvalî*, and translated by the late Dr Roer in the *Bibliotheca Indica* (Calcutta, 1850), and the popular *Tarkasangraha* in several editions; edited also and translated by Dr Ballantyne (2d edit., Calcutta, 1848), who in his preface gives a catalogue of the commentaries which this work has elicited. The reader not acquainted with Sanscrit is, for further information on the subject, referred to these translations, and to the essays on the V. system by H. T. Colebrooke (*Miscellaneous Essays*, vol. i., Lond. 1837), and Professor M. Müller, in the 6th and 7th volumes of the *Zeitschrift der deutschen morgenländischen Gesellschaft*.

VAISHN'AVAS is the name of one of the three great divisions of Hindu sects. See INDIA, section *Religion*. The word, derived from *Vishn'u* (q. v.), designates the worshippers of this deity, and comprises a great variety of sects; but this variety itself differs according to different periods of the medieval history of India, old divisions becoming extinct, and new ones taking their place. Thus, the account of the V., as given in a celebrated work of *Anandagiri*, the *'Sankara-dig-vijaya*, or the victory of the great theologian S'ankara over his religious adversaries, would no longer apply in detail to the present condition of the V.; and even some of those varieties mentioned by the late Professor Wilson in his *Sketch of the Religious Sects of the Hindus*, written in 1832, would seem to have disappeared already in our days. The common link of all the sects comprised under the name of V., is their belief in the supremacy of Vishn'u over the other gods of the Trimûrti (q. v.). Their difference consists in the character which they assign to this supremacy, and to the god Vishn'u himself, in the religious and other practices founded on the nature of their belief, and in their sectarian marks. The following sects belonging to this category may especially be noticed here.

1. The *Râmânujas*, or *S'rî Vaishn'avas*, or *Srî-Sampradâyins*. They derive their origin from *Râmânuja*, a celebrated reformer, who was born at Perumbur, in the south of India, about the middle of the 12th c., and is considered by his followers as an incarnation of *S'esha* (q. v.), the serpent of Vishn'u. He studied at Conjeveram, resided afterwards at S'rîranga, and then travelled over different parts of India, where he was especially engaged in combating the professors of different creeds, particularly the S'aivas. On his return to S'rîranga, he was seized by the king Kerika'la Chola, but effected his escape, and found refuge with the Jain king of Mysore, Vitâla Deva, whom he converted to the Vaishn'ava faith. For twelve years he then remained at Mysore; but at the death of the Chola king, returned to S'rîranga, where he spent the remainder of his life in religious seclusion. The Râmânujas address their worship to Vishn'u and his consort, Lakshmî (q. v.), and their respective incarnations, either singly or conjointly. Hence their sect consists of corresponding subdivisions, according as Nârâyan'a or Lakshmî, or Lakshmî-Nârâyan'a, or Râma, or Sîtâ or Sîtâ-Râma, or any other incarnation of these deities, is the preferential object of the veneration of the votary. Their most striking peculiarity is the preparation and the scrupulous privacy of their meals; for should the meal during its preparation, or while they are eating, attract even the looks of a stranger, the operation is instantly stopped, and the viands buried in the ground. The marks by which they distinguish themselves from other sects are two perpendicular white lines, drawn with a white earth, *Gopîchandana*, from the root of the hair to the commencement of each eyebrow, and a transverse streak connecting them across the root of the nose; in the centre is a perpendicular streak of red, made with red sanders, or a preparation of turmeric and lime; other marks, representing several of the attributes of Vishn'u, they have either painted or impressed on the breast and each upper arm; and, besides, they wear a necklace of the wood of the Tulasî (holy basil), and carry a rosary of the seeds of the same plant, or of the lotus. The sacred formula with which a member of this sect is initiated into it consists merely of the words *Om râmâya namah'*, 'Om, salutation to Râma.' Their principal religious tenet is the belief that Vishn'u is the cause and creator of all worlds; that he and the universe are one, though he is of a twofold form: the supreme spirit or cause, and the gross one, the effect or matter. In distinction from the Vedânta, with which their doctrine has otherwise many points of contact, they regard their supreme deity as endowed with qualities, all of which are of course excellent; and teach that the universe consists of *chit*, thinking or spirit, *achit*, unthinking or matter, and *îs'wara*, or god; the relation of which is that of enjoyer, the thing enjoyed, and the ruler of both. The deity, they assume, is or has been visibly present in five modifications; in the objects of worship, as images, &c.; in the incarnations (see under VISHN'U); in certain forms called Vyûhas, viz., Vâsudeva, or Kr'ishma; Balarâma, Pradyumna, and Aniruddha; and in the subtle form which comprises six qualities—absence of passion, immortality, exemption from pain or care, absence of natural wants, love, and practice of truth—and the human soul; all of which have to be worshipped seriatim, as the votary ascends in the scale of perfection. The chief authoritative works in Sanscrit of this sect are the *Vedânta Sûtras*, with several commentaries, several works on the Vedânta (q. v.) philosophy, the *Pancharâtra* of Nârada; of Purân'as (q. v.), the *Vishn'u*, *Nâradîya-*, *Garud'a-*, *Padma-*, *Varâha*, and *Bhâgavata Purân'a*; and besides, the works of *Venkat'a*, and several popular works in the dialects of the south. It is in the south that the followers

of Râmânuja, and their temples and establishments, are still numerous; in the north of India, where they are better known as *S'rî Vaishn'avas*, they are not of frequent occurrence.

2. The *Râmânandas*, or *Râmâvats*. They are by far the most numerous class of sectaries in Gangetic India: in the district of Agra, they alone constitute seven-tenths of the ascetic population. They belong chiefly to the poorer and inferior classes, with the exception of the Rajputs and military Brahmans. The founder of this sect was *Râmânanda*, who, by some, is considered to have been the immediate disciple of Râmânuja; by others, the fifth in descent from that teacher, when he would have lived about the end of the 13th c.; but other more reliable accounts place him toward the end of the 14th, or the beginning of the 15th century. According to common tradition, Râmânanda seceded from the Râmânujas, to whom he originally belonged, because, having spent some time in travelling through various parts of India, and, in consequence, having been suspected by his fellow-disciples not to have conformed to the rule of the Râmânujas in taking his meals, he was condemned to feed in a place apart from the rest of them, but did not acquiesce in the affront thus offered him. His residence was at Benares, at the Pancha Gangâ Ghât', where a *Math*, or monastery, of his followers is said to have existed. The especial object of their worship is Vishn'u, in his incarnation as *Râmachandra*, and his consort *Sîtâ*, and, as amongst the Râmânujas, these deities either singly or jointly. Some members of this sect also pay adoration to other forms of Vishn'u; and the religious mendicants of the sect consider all form of adoration superfluous, being content with the incessant invocation of Krishn'a and Râma. Their practices are less precise than those of the Râmânujas; but the most important difference between them consists in the fact, that Râmânanda abolished the distinction of caste amongst the religious orders, and taught that a *Vairâgin*, or one who quitted the ties of nature and society, shook off at the same time all personal distinction. The initiatory formula of a Râmânanda is *S'rî Râma*, or 'blessed Râma.' Their sectarian marks are the same as those of the Râmânujas; except that the red perpendicular streak on the forehead is varied in shape and extent, and generally narrower than that of the Râmânujas. There are various subdivisions of this sect, believed to have been founded by several eminent disciples of Râmânanda. Their doctrines vary often from that of the latter, but they maintain an amicable intercourse with the Râmânujas and with each other. The twelve chief disciples of Râmânanda were *As'ânand*, *Kabîr*, *Raidâs*, *Pîpâ*, *Sursurânand*, *Sukhânand*, *Bhavânand*, *Dhavana*, *Sena*, *Mahânand*, *Paramânand*, and *S'rî Anand;* and besides these *Nâbhâji*, the author of the Bhaktamâlâ, *Sûr-Dâs*, *Tulasî-Dâs*, the translator in Hindi of the Râmâyan'a, and the author of many popular works which exercise a considerable influence on the Hindu population, and the poet *Jayaadeva*, the author of the Gîtagovinda. Many legends, of course, are related of these personages, especially in the Bhaktamâlâ, the favourite work of this sect.

3. The *Kabîr Panthis*. The founder of this sect, one of the most interesting and important in Upper and Central India, except, perhaps, in Bengal itself, was Kabîr, the most celebrated of the twelve disciples of Râmânanda, before mentioned, who, therefore, probably lived about the end of the 14th century. The circumstances connected with his birth, life, and death are all related as miraculous; and so little is certain about his life, that even the Mussulmans claim him as one of their persuasion. But his great conversancy with the Hindu *S'âstras*, and his limited knowledge of the Mohammedan authorities, render such a supposition highly improbable. According to the doctrine of this sect, there is but one God, the creator of the world; but, in opposition to the Vedânta (q. v.), they assert that he has a body formed of the five elements of matter, and a mind endowed with the three *gun'as*, or qualities: he is of ineffable purity and irresistible power, eternal, and free from the defects of human nature, but in other respects does not differ from man. The pure man is his living resemblance; and after death, becomes his equal and associate. God and man are therefore not only the same, but both in the same manner everything that exists. For 72 ages, God was alone; he then felt the desire to renew the world, which desire assumed the shape of a female form; and this form is Mâyâ (q. v.), or illusion, with whom he begot the triad, Brahman, Vishn'u, and S'iva. He then disappeared, and Mâyâ approached her offspring, in order to frame the universe. Vishn'u hesitated to associate with her, and is therefore more respected by the Kabîr Panthis than the other two gods of the triad; but the latter were frightened by her, and the result of their submission was the birth of Saraswatî, Lakshmî, and Umâ, whom she wedded to the three deities to produce the world. To understand the falsehood of Mâyâ is, therefore, the chief aim of man; and so long only as he is ignorant of the source of life, he is doomed to Transmigration (q. v.), which, according to the belief of this sect, is also extended to the planetary bodies—a falling star or meteor being a proof, for instance, that it undergoes a fresh change. The moral code of the Kabîr Panthis is, in many respects, creditable to them. Life, they teach, being the gift of God, must not be violated by his creatures. Humanity and truth are two of their cardinal virtues; retirement from the world is deemed desirable; and implicit devotion, in word, act, and thought, to the Guru, or spiritual teacher, a supreme duty. But, as regards the latter point, it is characteristic that the pupil is enjoined first to scrutinize the teacher's doctrine and acts, and to be satisfied that he is the sage he pretends to be, before he resigns himself to his control. It is no part of their faith to worship any deity, or to observe any ceremonies and rites of the Hindus; but they are recommended outwardly to conform to all the usages of tribe and caste, and some even pretend to worship the usual divinities, though this is not considered justifiable. They have no peculiar mode of dress, and though some wear the sectarian marks of the V., and the necklace and rosary, all these outward signs are considered of no importance. Though, therefore, properly speaking, they can scarcely be included amongst the Vaishn'ava sects, yet their paying more respect to Vishn'u than to any other god of the Trimûrti (q. v.), and the fact of Kabîr having been a disciple of Râmânanda, also the friendly intercourse which they maintain with most of the Vaishn'ava sects, cause them always to be looked upon as belonging to them. The doctrines of Kabîr are taught in a great variety of works in different dialects of Hindi, all of which are the acknowledged compositions of his disciples and successors. The principal are the *Sâkhîs*, 5000 in number, consisting of one stanza each; the *Bîjak*, in 654 sections; and the *Sukh Nidhân*. The sect itself is split into a number of subdivisions, and twelve branches of it are traced to the following personages: *S'rutgopâl Dâs*, the author of the Sukh Nidhân—his successors preside over the Chaura at Benares; *Bhago Dâs*, the author of the Bîjak; *Nârâyan Dâs* and *Churâman' Dâs*, the two sons of a merchant at Jabbalpur; *Jaggo Dâs*, of Kuttack; *Jîvan Dâs*

Kamâl, of Bombay; *Tâk Sâlî*, of Baroda; *Jnânî*, of Majjhnî, near Sahâs'râm; *Sâheb Dâs*, of Cuttack; *Nityânand*, and *Kamâl Nâd*, in the Dekhan. The principal establishment of the sect is the Kabîr Chaura at Benares.

4. The *Vallabhâchâryas*, or *Rudra Sampradâyins*. The original teacher of this sect is said to have been *Vishn'u Swâmin;* but it is a later successor of his, *Vallabha Swâmin*, or *Vallabha Acha'rya*, who, from the influence which his teaching and writing exercised on the propagation of his doctrines, must be considered the real founder of this sect. He was born in 1479, in a forest called Champâran'ya, where his parents deserted him on a pilgrimage they had undertaken to Benares. The gods, of course, took care of the infant; and his parents, who recovered him afterwards, took him to Gokula, a village on the left bank of the Jumna, a short distance from Mathura, where he received his first education. In his twelfth year, he left this place, in order to propagate throughout India his tenets, which at that time, it must be understood, he had already framed. On arriving at a certain town in the south of India, he became acquainted with a person of influence, *Damoradâs*, whom he converted to his doctrine. Both of them then proceeded together to the city of Vijayanagar, where the maternal parents of Vallabha resided. He was now introduced to the court of the king of Vijayanagara, Krishn'adeva, and succeeded so well in his disputation with the S'aivas and Smârta Brâhmans, that not only the king bestowed on him rich presents, but the Vaishn'avas elected him as their chief, with the title of Âchârya, or spiritual teacher. He then travelled to Ujjayin, Allahabad, and Benares, and from there, for nine years, through different parts of India, until, on his return to Brindâvan, as a reward for his exertions and faith, he was honoured by a visit from the god *Kr'ishn'a* in person, who enjoined him to introduce his worship, and to found the religion now so widely diffused throughout Western India under the sectarian name of *Rudra Sampradâya*. Vallabha ultimately settled at Benares, and there composed 17 works in Sanscrit, the most important of which are a commentary on the Vedânta (q. v.) and Mimânsâ (q. v.) Sûtras, and one on the Bhâgavata Purân'a; works, however, only intended for the learned, and now very rare. He died on a hill in the vicinity of Benares, in his 53d year, after having made 84 devoted disciples. He was succeeded by his second son, *Vithalnâthji*, who was born in 1516, in the village of Parn'ât, and is known amongst the sect by the designation of S'rî Gosâin Jî, his father Vallabha's sectarian name being S'rî Achârya Jî. Vithalnâthji died in 1583, and left, besides four daughters, seven sons, who were all teachers, and formed as many communities; viz., *Girdharji* (born 1540), *Govinda Rây* (born 1542), *Bâlkr'ishn'aji* (born 1549), *Gokulnâthji* (born 1551), *Ragunâthji* (born 1554), *Jadunâthji* (born 1556), and *Ghanashyamji* (born 1561). It was, however, *Gokulnâthji* who became the most celebrated of the descendants of Vithalnâthji, for to him especially is due the vitality of this sect; and even to the present day the followers of his descendants consider their own Gosâins the only legitimate teachers of their faith, while even the adherents of the other sons of Vithalnâthji pay them the greatest respect. It is about the period when the sons of Vithalnâthji dispersed that they first acquired the title of *Mahârâj*, or 'great king,' by which the chiefs of this sect are now best known, though besides this proud designation they have other distinctive titles, such as *Vallabha Kula*, *Agni Tula*, *Guru*, &c. The heads of the Gokulnâthli division of this sect are usually called *Gokul Gosâins*, or *Gokulastha Gosâins*. The members of this sect are widely diffused throughout Bombay, Cutch, Kattywar, and Central India, and especially the province of Malwa. Their establishments and temples are numerous throughout India; especially at Mathura, Brindâvan, and Benares. The most celebrated of all is at S'rî Nâth Dwâr, in Ajmeer; and the members themselves belong to the better and wealthier classes of the Hindu community. At present, there are about 60 or 70 'Mahârajas' of this sect dispersed over India; eight or ten of whom reside at Bombay alone, and fifteen or sixteen at Gokul. But so much degenerated are they as a body, that only two or three of them have any knowledge of Sanscrit; the rest, as a distinguished writer on this sect, Mr Karsandâs Mulji, asserts, being grossly ignorant; for, as Wilson remarks, it is a curious feature in the notions of this sect, that the veneration in which the Gosâins are held is paid solely to their descent, and unconnected with any idea of their sanctity and learning; and that, though they are not unfrequently destitute of all pretensions to individual respectability, they nevertheless enjoy the unlimited homage of their followers.

The chief authority of the sect is the *Bhâgavata Purân'a* (q. v.), and after it, the works of Vallabha and various books, 74 in number, 39 of which are translations from Sanscrit, and the rest original compositions in the Brijbhâshâ dialect. The object of their adoration is Vishn'u (q. v.) in his incarnation as Kr'ishn'a, whose residence is Goloka, far above the three worlds. There he originally lived alone, but in meditating on the works of creation, created a female form, which became the primary agent in creation: this was Mâyâ. He then produced crude matter, the five elements, and all the divine beings; the gods of the Trimûrti, their female consorts, and 300 millions of Gopîs, or cowherdesses, who are the especial attendants on Kr'ishn'a. The principles of the sect, as laid down by Vallabha, are the following ten—1. To secure the firm support of Vallabhâchârya; 2. To exercise chiefly the worship of Kr'ishn'a; 3. To forsake the sense of Vaidik opinion, and be a suppliant to Kr'ishn'a; 4. To sing praises with feelings of humility; 5. To believe that Vallabha is a Gopî, or mistress of Kr'ishn'a; 6. To swell the heart with the name of Kr'ishn'a; 7. To forsake his commands not for a moment; 8. To put faith in his words and doings; 9. To adopt the society of the good, knowing them divine; and, 10. To see not the faults, but speak the truth. Out of this code, however, grew up the doctrine, that the Guru or Mahârâj is the impersonation of Kr'ishn'a himself, that God and the Guru are necessarily to be worshipped, and that the sectary is bound to bestow on him 'his body, organs of sense, life, heart, and other faculties, and wife, house, family, property, with his own self.' The gross abuse which was made of this tenet became apparent in a very remarkable trial, the so-called Mahârâj Libel Case, which took place in 1861 in the Supreme Court of Bombay, and revealed the licentiousness of one of the then Mahârâjas of the sect at Bombay; the defendant sued for libel by this Mahârâj being a highly respected and distinguished member of the sect, Mr Karsandâs Mulji, who had had the courage of calling, in a native newspaper, on the Mahârâjas to reform, and to return to the ancient Hindu faith, and whose public conduct on that occasion elicited the highest praise of the court, and, it is to be hoped, initiated a better era of this sect. The temples of the sect have images of Kr'ishn'a, and Râdhâ, his principal wife, the former representing a chubby boy, of a dark hue, who is richly decorated, and eight times a day receives the homage of his worshippers. The ceremonials

which on those occasions take place are the *mangala*, or morning levee, about half an hour after sunrise, when the image is washed and dressed, and presented with refreshments; the *s'ringâra*, when the image, having been anointed and perfumed, holds his public court—this takes place about an hour and a half after the preceding; the *gwâla*, 48 minutes after the last, the image being now visited preparatory to its going out; the *râjabhoga*, held at mid-day, when Kr'ishn'a is supposed to have come home from the pastures and sat down to dine—all sorts of delicacies are then placed before the image, and distributed to the votaries present; the *utthâpana*, three hours before sunset, when the god is summoned to get up from his siesta; the *bhoga*, or afternoon meal, about half an hour later; the *sandhyâ*, about sunset, or the evening toilet of the image; and the *s'ayana*, or retiring to repose, about seven in the evening; the image then being put upon a bed, and refreshments being placed near it, when the votaries retire, and the temple is shut till the ensuing morning. Besides these ceremonies, there are other annual festivals observed by this sect throughout India; of these, the *Rath Yâtra*, or procession of the god in a chair, is the most celebrated in Bengal and Orissa; the most popular at Benares is the *Janmâshtamî*, or the nativity of Kr'ishn'a; and the *Râs Yâtra*, or annual commemoration of the dance of Kr'ishn'a with 16 Gopîs—a very popular festival, at which all kind of rejoicings take place. The mark on the forehead of the Vallabhâchâryas consists of two perpendicular lines meeting in a semicircle at the root of the nose, and having a round spot of red between them. On the breasts and arms, they have the same marks as the Râmânujas, made with a black earth called *S'yâmabandî*, or any black metallic substance; their necklace and rosary are made of the stalk of the Tulasî (holy basil) plant.—For a fuller account of this sect, its authorities, festivals, and worship, and the practices of the Mahârâjas, see the interesting *History of the Sect of Mahârâjas or Vallâbhâchâryas in Western India* (by Karsandâs Mulji—London, 1865), which also contains the history of the 'Mahârâj Libel Case' above referred to.

5. The *Mâdhwâchâryas*, or *Brahma Sampradâyins*. This sect occurs especially in the peninsula, and was founded by a Brahman, *Mâdhwâchârya*, who is looked upon by his followers as an incarnation of Vâyu, the god of wind, after having been incarnate in preceding ages as Hânumat (q. v.) and Bhîma. He was born in the year 1199, and educated in a convent at Anantes'war. In his ninth year, he was initiated into the order of Anchorites by Achyuta Pracha, a descendant of Sanaka, a son of Brahman. At that early age he composed a commentary on the Gîtâ; then travelled to the Himâlaya, and when returned, erected at Udipi the image of Kr'ishn'a, which had been originally made by Arjuna, and miraculously recovered by him. In addition to the principal temple at Udipi, he established eight other temples in Tuluva, below the Ghâts; composed, it is related, 37 works, and on a controversial tour, triumphed over various divines. In his 79th year he went to Badarikâs'rama, where, the legend says, he continues to reside with Vyâsa, the compiler of the Vedas and Purân'as. It seems that he was originally a priest of the S'aiva faith, and one of his names, *Ananda Tîrtha*, even indicates that he belonged to the class of Das'namî Gosâins, who were instituted by *S'ankarâchârya* (q. v.). He encouraged, therefore, an attempt to form a kind of compromise between the S'aivas and Vaishn'avas; and in the temples of his sect, images of S'iva are allowed to partake of the worship offered to those of Vishn'u. Votaries of the Mâdhwa Gurus and of S'ankarâchârya Gosâins offer also the reverential obeisance to their teachers mutually, and the latter visit the temple of the former to perform their adoration at the shrine of Kr'ishn'a. The essential dogma of this sect is the identification of Vishn'u with the Supreme Soul, as the pre-existent cause of the universe; and this primeval Vishn'u they affirm to be endowed with real attributes, and although indefinable, to be most excellent and independent. But besides this independent, there is also a dependent, principle; for besides the supreme soul, *Paramâtman*, there is a living soul, *Jîvâtman*, which is dependent on the Supreme; and though indissolubly connected with, yet not the same with him. In consequence, they deny the absorption of the human soul into the universal spirit, and the loss of independent existence after death. In this respect, they differ, therefore, on a vital point of doctrine, from the members of other Vaishn'ava and S'aiva sects. The manner in which they conceive the universe to have issued from the Supreme Being, is to a great extent analogous to that of the other Vaishn'avas; and they also receive the legends of the Vaishn'ava Purân'as relating to the birth of Brahman, from the lotus, which grew out of the navel of Vishn'u, &c. The modes of worshipping Vishn'u they declare to be three: marking the body with his symbols, especially by means of a hot iron; giving his names to children and objects of interest; and the practice of virtue in word, act, and thought. That in word consists in telling the truth, giving good counsel, mild speaking, and study; that in act comprises liberality, kindness, and protection; and clemency, freedom from envy, and faith, are the practice of virtue in thought. Final liberation, or freedom from future birth, they consider as the reward for having secured the favour of Vishn'u by sedulously worshipping him; and those who have attained it, enjoy felicity in Vishn'u's heaven, under one or all of the four conditions: of being similar to him in form, of remaining in his visible presence or in his proximity, and of sharing equal power with him.

Their worship is not materially different from that of the other V., except in one peculiarity, which proves that they have a friendly leaning towards the S'aiva sect; for the images of S'iva, Durgâ, and Gan'es'a are placed by them in the same shrine as Vishn'u. The Gurus, or superiors, of this sect are Brahmans and ascetics, or profess cœnobitic observances; the disciples live in their *Maths*, or monasteries, and profess also perpetual celibacy. The lay votaries of these teachers are members of every class of society except the lowest. The Gurus adopt the external appearance of ascetics, laying aside the Brahmanical cord, carrying a staff and water-pot, going bareheaded, and wearing a single wrapper of an orange colour. The marks common to them and the lay votaries are the symbols of Vishn'u upon shoulders and breast, and the frontal mark, consisting of two perpendicular lines made with the white clay *Gopîchandana*, and joined at the root of the nose, like that of the Râmânujas; but instead of a red line down the centre, they make a straight black line with the charcoal from incense offered to Nârâyan'a, terminating in a round mark made with turmeric. The scriptural authorities of this sect are, besides the writings of its founder, the four *Vedas*, the *Mahâbhârata*, the *Panchârâtra*, and the original *Râmâyan'a*.

6. The *Vaishn'avas of Bengal*, the far greater number of worshippers of Vishn'u, in Bengal, form one-fifth, or, according to another estimate, nearly one-third of the population of this province. Their founder, *Chaitanya*, was the son of a Brahman settled at Nadîya, but originally from Silhet. He was born in 1485, and his birth was accompanied by

the usual portentous indications, described in Hindu legends, of a superhuman event. He was, in fact, an incarnation of Kr'ishn'a, who appeared for the purpose of instructing mankind in the true mode of worshipping him in this age. Up to his 24th year, Chaitanya seems to have lived without any great pretensions to sanctity; he married, it is said, a daughter of Vallabhâchârya, and supported his mother after the death of his father, which occurred in his childhood. At twenty-four, however, he shook off the obligations of society, and became an ascetic, travelled between Mathurâ and Jagannâth, and taught his doctrine. At the end of his peregrinations, he nominated his two principal disciples, *Adwaitânand* and *Nityânand*, to preside over the V. of Bengal, and *Rûpa* and *Sanâtana* over those of Mathurâ. Chaitanya himself then settled at Cuttack, where he remained twelve years, engaged in teaching and controversy, and in intent meditation on Kr'ishn'a. There he had frequent visions of Kr'ishna, Râdhâ, and the Gopîs, and, in one of these fits of ecstasy, was nearly drowned in the Jumna. Ultimately, he disappeared—how, is not known—about 1527. Of his two chief disciples, *Adwaitânand* resided at S'ântipur, and seems to have been a man of some property and respectability. *Nityânand* was a resident of Nadîya, and a householder, and his descendants are still in existence. Besides these three Prabhus, or chiefs, the V. of Bengal acknowledge six Gosâins as their original teachers, viz., *Rûpa*, *Sanâtan*, *Jîva*, *Raghunâth Bhat't'*, *Raghunâth Dâs*, and *Gopâl Dâs*; and next to them they hold in veneration *S'rînivâs*, *Gadâdhar Pan"dit*, *S'rî Svarûpa*, *Râmânand*, and others, including *Haridâs*, who especially obtained almost equal honour with his master Chaitanya. In addition to these chiefs, the sect claims eight eminent poets, amongst whom *Krishna Dâs* is the most celebrated. According to the doctrine of the sect, *Kr'ishn'a* is the Supreme Spirit, who, for various purposes, assumed specific shapes, in which he became incarnate (see VISHN'U); and so far there is not much real difference between the tenets of this and other Vaishn'ava sects. But an important innovation, introduced by its founder, is the doctrine of *Bhakti*, or faith, which, he teaches, is infinitely more efficacious than abstraction, than knowledge of the divine nature—as enjoined by the philosophical systems—than the subjugation of the passions, than the practice of the Yoga, than charity, virtue, or anything deemed most meritorious. A consequence resulting from this doctrine is, that all castes become by such faith equally pure, and therefore that all castes are admissible into the sect; that all are at liberty to sink their social differences in the condition of ascetics, in which character they may live with each other without regard to former distinctions, and that all members of the sect are equally entitled to the food which has been previously presented to the deity. The *Bhakti*, or faith, comprehends five stages: quietism, as that of sages; servitude, which every votary takes upon himself; friendship for the deity, such as is felt by Bhîma and others honoured with his acquaintance; tender affection for the deity, of the same nature as love of parents for their children; and the highest degree of affection, such passionate attachment as the Gopîs felt for their beloved Kr'ishn'a.

The manner of expressing these feelings in acts of divine worship is about the same as that represented by the ceremonial of the Vallabhâchâryas; but the secular worshippers are generally content with paying their homage twice a day to the idol of Kr'ishn'a. Their chief ritual is a very simple one; it consists of constantly repeating the name of Kr'ishn'a—a practice of which one of their chiefs, Haridâs, set them a remarkable example, as during many years, when he resided in a thicket, he repeated the name of Kr'ishn'a 300,000 times daily. Their other duties are sixty-four, including many moral and many absurd observances, as suppressing anger, avarice, and lust, and singing and dancing in honour of Kr'ishn'a, and fasting every eleventh day. The most important of all their obligations, however, is their servile veneration of the spiritual teacher, whom they are bound to look upon as the deity himself, and even as possessed of more authority; for they are taught that 'the prayer is manifest in the Guru, and the Guru is Vishn'u himself;' again: 'First, the Guru is to be worshipped, then I (Vishn'u) am to be worshipped;' and, 'When Vishn'u is in anger, the Guru is our protector; but when the Guru is in anger, we have none.' In this respect, the doctrine of the V. of Bengal is similar to that of the Vallabhâchâryas, and their practice also agrees in so far as the V. look upon the dignity of their Gurus as hereditary, and not depending on personal capacity or sanctity; but, as in the case of the Vallabhâchâryas, this practice does not appear to have been enjoined by their original teachers. Liberation from terrestrial existence, most votaries of this sect do not conceive in the spirit of the Vedânta, which teaches that final deliverance is the absorption of the human soul into the divine essence; but, in their opinion, it is twofold, either perpetual residence of the soul in Swarga, or paradise, with possession of the divine attributes of power, &c.; or elevation to *Vaikun't'ha*, the heaven of Vishn'u, where they enjoy felicity under one or all of the four conditions, under which also the Madhwâchâryas conceive such felicity to exist. Chaitanya and his two chief disciples did not leave, as it seems, written compositions; the rest of his pupils, however, wrote numerous works in Sanscrit and Bengali. The V. of this sect are distinguished by two white perpendicular streaks of sandal, or *Gopîchandana*, down the forehead, uniting at the root of the nose, and continuing to near the tip; by the names of *Râdhâ-Kr'ishn'a* stamped on the temples, breast, and arms; by a close necklace of Tulasî stalk of three strings, and a rosary of 108 or sometimes 1000 beads made of the stem of the Tulasî. The sectaries consist of every caste and order, and are governed by the descendants of their Gosâins: some live in a state of celibacy; the teachers, however, are married men.

There are several divisions of this sect, arising from the various forms under which Vishn'u is worshipped; but besides them, there are three which may be looked upon as seceders from the original sect—viz., the *Spasht'a Dâyakas*, the *Kartâ Bhâjas*, and the *Sâhujas*.

The *Spasht'a Dâyakas* deny the divine character and authority of the Guru, and allow the association of male and female cœnobites in one conventional abode, where their relation is that of brothers and sisters, and their common interest the worship of Kr'ishn'a and Chaitanya. The women act also as the spiritual teachers of the females of respectable families, and the consequence is the growing diffusion of the doctrines of this sect in Calcutta, where it is especially established.—The *Kartâ Bhâjas* are of very recent origin, and, as they acknowledge the absolute divinity of the Guru, there would not be much difference between them and the original body of the V. of Bengal, had they not broken through the old line of hereditary teachers, and invested a new family with spiritual power—viz., that of their founder, *Râma-S'aran-Pâl*, who, at the beginning of this century, was successful in his attempt to create this schism.—Of the *Sâhujas*, very little is known, their professions and practices being kept secret.

These are suspected not to be of a very moral character. The chief temples of the V. of Bengal are at Dwarakâ, Brindâvan, Jagannâth, Nadîya, Ambika, and Agradwîpa.

Besides these Vaishn'ava sects, there are others of less importance, which it must here suffice merely to enumerate by name—viz., the sect of the *Khâkins*, founded by *Kîl*, the disciple of Krishn'adâs, and established chiefly at Hanumángád'hí, in Oude; the *Màlúk Dâsas*, founded by *Mâlúk Dâs* about 1600, or the end of the Emperor Akbar's reign—their principal establishment is at Kara Manikpur; the *Dâdû Panthis*, founded by *Dâdû*, a pupil of one of the Kabîr teachers, about the same time, and established especially in Marwar and Ajmeer; the *Rai Dâsas*, founded by *Rai Dâs*, a disciple of Râmânanda, a sect, it is said, confined to the very lowest of the mixed Hindu castes, or the workers in hides and leather; the *Senâ Panthis*, who derive their origin from *Senâ*, the barber, the third of Râmânanda's disciples; the *Mîrâ Bâis*, a subdivision of the Vallabhâchâryas, established by *Mîrâ Bâî*, the daughter of a petty Râjâ of Mertâ, and the wife of the Rân'a of Udayapur; the *Sanakâdi Sampradâyins*, or *Nîmâvats*, throughout Upper India, founded by an ascetic Nimbâditya; the *Râdhâ Vallabhis*, who consider Harivam's' as their founder, a personage who lived about 300 years ago, and established a monastery at Brindâvan; the *Sakhî Bhâvas*, probably owing their origin to the last-named sect; the *Charan' Dâsas*, whose chief seat is at Delhi, founded by *Charan' Dâs*, a merchant of the Dhûsar tribe, who resided at Delhi, in the reign of the second Alemgîr; the *Haris'chandis;* the *Sadhnâ Panthis*, founded by *Sadhnâ*, a butcher; and the *Mâdhavis*, founded by *Mâdho*.—For a fuller detail, see H. H. Wilson's *Sketch of the Religious Sects of the Hindus*, edited by Dr Rost in Wilson's Works, vol. i. (Lond. 1862); and on the Vallabhâchâryas, the *History of the Sect of the Mahârâjas* (by Karsandâs Mulji), mentioned above (Lond. 1865).

VALAIS (Ger. *Wallis*), a frontier canton of Switzerland, bounded on the N. by the cantons of Vaud and Bern, and on the S. by Italy. Area, 2016 sq. miles; pop. (1880) 100.216. It forms one long and deep valley, included between two of the loftiest mountain chains of Europe—the Pennine and the Bernese Alps—and is drained by the Upper Rhone, which, rising at its north-eastern extremity, in the glacier of the Gallenstock, falls at the western boundary of the canton into the Lake of Geneva. No European territory is more completely isolated by mountains; and it is rendered still more inaccessible by transverse chains, between which are enclosed narrow valleys. The greater part of the surface consists of barren mountain slopes; in their higher elevations, covered with the greatest of the Swiss glaciers. The forests and pasture-lands supply the inhabitants with their chief occupations. But grain-cultivation is not absent; the chief agricultural tract being the level ground, from a quarter of a mile to three miles wide, which lies along the main channel of the river. Here corn enough is grown to supply the wants of the inhabitants. The heat at the bottom of the valley is intense in summer, and Indian corn and the vine are grown with great success. The V. opens into the Lake of Geneva, and is connected by great high-roads, and now by railway, with the other parts of French Switzerland and Savoy. The Grimsel and Gemmi passes connect the eastern part of the valley with German Switzerland; and the Great St Bernard and Simplon (q. v.) passes connect it with Italy. Formerly, the cattle, the chief export of V., were driven over the Simplon into Italy, but now the railway, which ascends the valley as high as Sion, on the Simplon road, threatens to divert this trade to Western Switzerland and France. The inhabitants of the Upper V.—one-third of the population—speak German; those of the Lower V., the Vaudois dialect of French. The line which separates the two languages lies along the ridges running north from the Matterhorn to a point a little to the east of Leuk. All the inhabitants are Roman Catholic. The V. is subdivided into dixaines, each of which has its council, and may be said to form a republic. Each of the dixaines sends four members to a larger council or diet meeting at Sion. The upper part of the V., throughout the middle ages, acknowledged a very slight feudal dependence on the German Empire; the lower part belonged to Savoy. At the period of the struggle of the Swiss with the Duke of Burgundy, the Upper V. took possession of the Lower V., and reduced it to the position of a vassal state; and in this condition it remained until 1798, the period of French conquest, when the distinction was set aside. As stated in the article SWITZERLAND, under the recent constitution, the suffrage was extended to the whole pop. of V., with results little expected by the Liberal party in the Swiss diet. Sion (q. v.) and Martigny (q. v.) are the chief towns.

VALCKENAER, LUDVIG KASPAR, an eminent Dutch philologist, born at Leeuwarden, in 1715, studied at Franeker, and in 1741, became Professor of Greek there. Subsequently, he was called to Leyden, where he died, March 14, 1785. V. was an admirable lecturer and commentator on the classics. To a thorough knowledge of their literature and antiquities, he added a fine critical discernment and thoughtfulness. Among his more notable performances are his recasting of Ursinus's *Virgilius cum Scriptoribus Græcis Collatus* (Leeuwarden, 1747), his editions of the Greek grammarian Ammonius (Leyd. 1739; Leip. 1822), of the *Phœnissæ* (Franek. 1755; Leip. 1824), and the *Hippolytus* (Leyd. 1768; Leip. 1823), his *Diatribe in Euripidis Perditorum Dramatum Reliquias* (Leyd. 1767; Leip. 1824); his edition of the so-called *Epistles of Phalaris* (Gröning. 1777), and of the *Idylls* of Theocritus (Leyd. 1779—1781; new ed., Leip. 1810). He also furnished a rich store of critical observations to Wesseling's Herodotus. Among his posthumous works are his *Callimachi Elegiarum Fragmenta* (Leyd. 1799), his *De Aristobulo Judæo* (Leyd. 1806), and his *Opuscula Philologica, Critica, Oratoria* (2 vols. Leip. 1808).

VA'LDAI HILLS. See NOVGOROD.

VALDEPE'ÑAS, a town of New Castile, in the modern province of Ciudad Real, and 30 miles east-south-east of the city of that name. It is a straggling mud-built town, situated in a district celebrated for its red wine. The wine, when obtained pure, which it seldom is except at V., is rich, fruity, full-bodied, high-coloured, and will improve for ten years. Pop. 7400.

VALENCE, a town of France, capital of the dep. of Drome, in a charming situation on the flank of a hill that borders the left bank of the Rhone, 65 miles south of Lyon by railway. The walls with which it is surrounded give it a gloomy appearance. Silk-weaving and silk-throwing are carried on, manufactures of printed and other cottons, and commerce in silk, fruits, wines, liqueurs, and spirits. Pop. 22.500.

VALE'NCIA, a small island on the south-west coast of Ireland, forms part of the county Kerry, is separated from the mainland by a narrow arm of Valencia Bay, and lies 38 miles west-south-west from Killarney. It is 5½ miles long and 2

miles broad; the soil is in many places good; half the entire area is under cultivation; and there are about 2500 inhabitants. On the west side, which is mainly high rocky moorland, there are valuable slate and flag quarries. On the north side of the island is Valencia Bay, an inlet of Dingle Bay; and Valencia Harbour, the most western in Ireland, is part of the bay of the same name. Here is the telegraphic station for the two Atlantic cables, now in operation. See TELEGRAPH. Of these, the first made to work was a new cable, laid in the summer of 1866—the other, the cable which was lost in 1865, was recovered by grappling, September 1, 1866, and safely prolonged to Heart's Content in Newfoundland.

VALE'NCIA, a former kingdom of Spain, now subdivided into the three modern provinces of Valencia, Alicante, and Castellon de la Plana (see SPAIN), comprises a tract of country in the east of Spain, washed by the Mediterranean, and bounded on the N. by Catalonia, and on the S. and S.-W. by Murcia.

In the middle districts of the kingdom are small plains, abounding in lagoons where they border on the Mediterranean, but furnished with few harbours; both in the north and south are mountain ridges, offsets from the eastern edge of the great central plateau of Spain. V. is remarkable for its fine climate, and for its fertility in the well-watered districts. The fruitful localities called the *Huertas* (gardens) yield three, and sometimes four harvests in the year. Neither wheat nor barley is largely grown, but the rice-crops are so abundant, that not only is the whole of Spain supplied with this article from V., but a considerable quantity is also exported. The country is rich in iron, lead, copper, cinnabar, cobalt, and coals. The lagoons on the coast, especially that of Albufera, are rich in sea-fowl and fish. The inhabitants, in whom is observable a strong mixture of Moorish blood, are remarkably industrious, and V. is known to be the most actively manufacturing province of Spain after Cataluña.

VALENCIA, an ancient city and seaport of Spain, formerly capital of the kingdom, and now of the province of the same name, stands on the shores of the Mediterranean, 294 miles east-south-east of Madrid by railway. The Huerta—35 English sq. m. in extent—which surrounds the city resembles an immense orchard, and is ingeniously watered by an intricate network of pipes and rivulets, laid down by the Moors eight centuries ago, and efficiently answering its purpose down to the present day. In this garden, the carob, citron, orange, palm, and mulberry grow in wild luxuriance. Nature, stimulated by constant moisture and a burning sun, exhibits a wonderful strength and fecundity. V. is surrounded by old picturesque battlemented walls, erected by Pedro IV. in 1356; the interior of the city is striking and pleasing; most of the streets are macadamised; and while, in the old quarters, the houses are closely packed and gloomy-looking, well suited to keep out the enemy, *heat*—those recently erected are high, gaily-coloured in blue, rose, cream-colour, &c.; decorated with elegant iron-gilt balconies, and furnished with courts freshened with flowers and cooled by fountains. V. is the see of an archbishop, and its cathedral, La Seo—the see—which was commenced in 1262, is classical in the interior, and Gothic in the exterior, is 350 feet long, and at the transepts, 216 feet wide. From the top of a tower which surmounts one of the portals, the view is said to be one of the most striking in Spain. In the cathedral and its chapels there are a number of magnificent pictures, including some by Ribalta and Joanes. The Church of the Colegio de Corpus is quite a museum of pictures by Ribalta, who, according to Ford, has painted heads equal to any produced by the old Venetians. There are also numerous and interesting picture-galleries, in the chief of which only the productions of the great Valencian school are to be seen. The custom-house, dating from 1758, is now the Cigar Factory, which employs 3500 women, and produces 120,000 lbs. of tobacco yearly. The university, with a public library of 40,000 vols., is well attended. Silk-spinning and weaving are extensively carried on. There are also extensive hemp and cloth weaving, and manufactures of hats, glass, linen, leather, and Valencia tiles for flooring. V. was long sunk, like the whole of the country, in a lethargic sleep, but it has within recent years awakened to activity. Its port has been improved; it is now connected with Madrid by railway, and being to its own metropolis what Brighton is to London, it is much visited in summer by the *Madrilenos*, who contribute greatly to its prosperity. There is considerable commerce with Britain. Pop. about 90,000.

V., or *Valentia de Cid*, is a very ancient city. It was destroyed by Pompey, and rebuilt by Sertorius, after which it became a *colonia*. It was taken by the Goths in 413 A.D., and by the Moors in 712. The *Cid* took it in 1094—1095, and ruled despotically here till 1099. The union of Ferdinand and Isabella brought it under the Castilian crown.

VALENCIA, Venezuela. See SUPP. in Vol. X.

VALENCIENNES, a manufacturing town and fortress of France, in the dep. of Nord, on the Escaut, 155 miles by railway north-north-east of Paris. It is well built, but it does not contain many objects of attraction of any sort. There are many pleasant promenades in the immediate vicinity. A famous kind of lace is made here, as well as fine woven fabrics and gauzes. Salt-making and sugar-refining are carried on, and there is an active trade in timber, wine, and oil. It is the birthplace of Watteau and Froissart. Pop. 20,000.

VA'LENS, emperor of the East, the brother of Valentinian I. (q. v.), was born near Cibalis in Pannonia, about 328 A.D., and was associated with his brother in imperial authority, receiving as his share of the empire, Asia, Egypt, and Thrace, March 28, 364. His sovereignty was, however, disputed by Procopius, a supposed scion of the race of Constantine, who raised his standard in Thrace, was crowned at Constantinople, and for two years maintained his ground with skill and courage, till the defeat of his troops at Thyatira and Nacosia, and his subsequent capture and cruel death, 366 A.D. The first prominent act of V.'s reign was a reduction of 25 per cent. in the taxes, which gained him the general good-will of his subjects, but was of questionable prudence in the unsettled state of the northern and eastern frontiers. The prolonged imprisonment of 3000 Ostrogoths, who had been sent to aid Procopius, led to a rupture between V. and the aged hero Hermanric, and to a war which lasted from 367 to 369. The contest was carried on in the country of the Goths, and was throughout in favour of the Romans. Difficulties arose immediately afterwards (370) with the Persians, who were desirous of possessing themselves of Armenia, and though the two powers came frequently into collision, the one as the assailant, and the other as the ally of the Armenian monarch, war was not declared till the end of 372, when the Romans were victorious. V., who had removed to Antioch at the commencement of the war, now occupied himself with the religious quarrels

between the Arians and the orthodox party, which at that time raged with much violence over the whole eastern empire. Incapable of independent judgment, he had adopted the views of his Arian councillors, and under their guidance, punished the more obstinate of the 'heretics.' At the same time, a conspiracy, prompted by professors of magical arts, who declared that V.'s successor should be one whose name began with *Theod*, was discovered, its promoters and agents punished with death, as well as a number of persons who were so unfortunate as to possess a name commencing with the unlucky prefix. Affairs on the eastern frontier again assumed a threatening aspect; but the Romans were disinclined any longer to interfere with the designs of the Persians on Armenia, and concluded a somewhat discreditable treaty in 376. In the meantime, events were taking place on the northern frontier which were destined ere long to become of sinister import to the Roman Empire. The Goths, who had for some time been peacefully settled in Dacia, were assailed by the advancing hordes of the Huns; the Ostrogoths, who first felt the shock, were partly incorporated, and the remainder forced to retreat; the Visigoths next attempted to stem the torrent, but without success, and immense crowds of fugitives belonging to this warlike race crowded to the north bank of the Danube. V. accorded permission to a large body of Goths under Fritigern to cross into Mœsia and Thrace, and take possession of the waste lands in these provinces; the fugitive Ostrogoths soon afterwards crossed the river without permission; and the alarm which the numbers and turbulence of his new subjects speedily aroused, led V. to the adoption of such impolitic measures, that the gratitude of the Goths for shelter afforded was turned to bitter resentment. V., prompted by his servile and flattering advisers, at last resolved on war; and marching against the barbarians, he engaged them near Adrianople, August 9, 378. His army was totally routed, and two-thirds of it, including V. himself and most of his chief officers, left dead on the field.—See Gibbon's *Decline and Fall*, chaps. 25 and 26; and Tillemont's *Histoire des Empereurs*, vol. v.

VALENTINE, BASIL, a celebrated German alchemist, of whom so little is known that it has been disputed whether he flourished in the 12th or the 15th century. It has been maintained that he was a monk of the order of St Benedict, in St Peter's convent at Erfurt, but his name does not appear on the list at Erfurt, nor on the general list kept at Rome. It seems probable that he flourished about the end of the 15th century. He was a diligent seeker for the philosopher's stone, and wrote a large number of works, chiefly on the process of transmutation, a complete list of which will be seen in Lenglet's *History of the Hermetic Philosophy*, vol. iii. Some of the titles are curious, as *Basil Valentine's Twelve Keys of Philosophy*, *Apocalypsis Chymica*, *Revelation of the Mystery of the Essential Colours of the Seven Metals*, *The Triumphal Car of Antimony*, *A Chemico-philosophical Tract concerning Things Natural and Præternatural*, &c. After his death, his works were thought to be wholly lost, when they were discovered in the stonework of the abbey, 'Heaven itself conspiring to bring to light these extraordinary works by shattering by a thunderbolt the pillar in which they were concealed,' if we are to believe his followers in the mystic art, who have handed the story down to us. His works were mostly written in the old Upper-Saxon dialect, and were not printed till 1602; after which time many of them were published in the form of French translations, though a few still remain in MS.

VALENTINE'S DAY, the 14th of February, is, or more correctly was, celebrated in England, Scotland, and in different parts of the continent, particularly Lorraine and Maine in France, by a very peculiar and amusing custom. On the eve of St Valentine, a number of young folk—maids and bachelors—would assemble together, and inscribe upon little billets the names of an equal number of maids and bachelors of their acquaintance, throw the whole into a receptacle of some sort, and then draw them lottery-wise—care, of course, being taken that each should draw one of the opposite sex. The person thus drawn became one's valentine. Of course, besides having got a valentine for one's self, one became, by the universality of the practice, some other person's valentine; but, as Misson, a learned traveller in the early part of last century, remarks, 'the man stuck faster to the valentine that had fallen to him, than to her to whom he had fallen.' These imaginary engagements, as may readily be supposed, often led to real ones; because one necessary consequence of them was, that for a whole year, a bachelor remained bound to the service of his valentine, somewhat after the fashion of a medieval knight of romance to his lady-love. At one period, it was customary for both sexes to make each other presents, but latterly the obligation seems to have been restricted to young men. During the 15th c., this amusement was very popular among the upper classes, and at many European courts. From Pepys's *Diary*, we see that in Charles II.'s reign, married as well as single people could be chosen.

For some time back, the festival—at least in England and Scotland—has ceased to possess the graceful symbolic meaning it used to have, and has become a considerable nuisance. 'The approach of the day is now heralded by the appearance in the printsellers' shop-windows of vast numbers of missives calculated for use on this occasion, each generally consisting of a single sheet of post-paper, on the first page of which is seen some ridiculous-coloured caricature of the male or female figure, with a few burlesque verses below. More rarely, the print is of a sentimental kind, such as a view of Hymen's altar, with a pair undergoing initiation into wedded happiness before it, while Cupid flutters above, and hearts transfixed with his darts decorate the corners. Maid-servants and young fellows interchange such epistles with each other on the 14th of February, no doubt conceiving that the joke is amazingly good; and, generally, the newspapers do not fail to record that the London postmen delivered so many hundred thousand more letters on that day than they do in general.'—Chambers's *Book of Days*, vol. i. p. 255.

The connection of the custom with St Valentine is purely accidental. In the legends of the different saints of that name recorded in the *Acta Sanctorum*, no trace of the practice peculiar to the 14th of February is found. It has been suggested by Mr Douce, in his *Illustrations of Shakspeare*, that the custom may have descended to us from the ancient Romans, who, during the *Lupercalia*, celebrated in the month of February, were wont among other things 'to put the names of young women into a box, from which they were drawn by the men as chance directed;' and that the Christian clergy, finding it difficult or impossible to extirpate this pagan practice, gave it at least a religious aspect, by substituting the names of particular saints for those of the women; and it is certainly a usage more or less widely extended in the Roman Catholic Church to select, either on St Valentine's Day or some other, a patron saint for the year, who is termed a valentine. But it is

far more probable that the custom of choosing valentines is a relic of that nature-religion which was undoubtedly the primitive form of religion in North-western Europe—as elsewhere; and that it sprung from a recognition of the peculiarity of the season. Hence in Bailey's Dictionary the following explanation is given: 'About this time of the year the birds choose their mates, and probably thence came the custom of the young men and maidens choosing valentines or special loving friends on that day.'

VALENTI'NIANS, a Gnostic sect or school (see GNOSTICS), founded by Valentinus, who went from Alexandria to Rome about 140 A. D., and died there, or in Cyprus, about 160. The distinguishing feature of his system lies, in the first place, in his recognising heathenism as a preparatory stage of Christianity; and then in his dividing the higher spiritual world into 15 pair of æons, each consisting of a male and a female. The first pair, or syzygy, is made up of Bythos, or God in himself, and Ennoia, or God as existing in his own thoughts; from these emanated next Nous (Intelligence) and Aletheia (Truth), and so on. As the last æon, Sophia, transgressed the bounds that had been laid down by the æon Heros, and a part of her being became lost in Chaos, there was formed a crude being, called Achanroth, which, through the Demiurgos that emanated from it, created the corporeal world. Heros now imparted to the souls of men (for all the bodies composing the corporeal world are possessed of souls) a *pneumatic* or spiritual element, but this only attained to full activity when Christ, a collective emanation from all the æons, appeared as Saviour, and united himself with the man Jesus. In the end, all that is pneumatic, and even the originally psychic or soul element in as far as it has assimilated itself to the psychic, will return into the Pleroma.

VALENTINIA'NUS, the name of three Roman emperors of the same family; the first and most famous of whom, VALENTINIANUS I., was the son of Gratianus (a rope-maker who had enlisted in the army, and risen to the grade of *comes militum*), and was born at Cibalis, in Pannonia, 321 A.D. V. entered the army at an early age, and, aided by the military renown of his father, rapidly rose in rank under the emperors Constantius and Julian, only, however, to fall more rapidly; for he was degraded by Constantius in 357, and, for his publicly expressed contempt for paganism, banished by Julian in 362. Restored to favour in the following year, he distinguished himself in the East, and on the death of Jovian was unanimously chosen as his successor, February 26, 364. A month after his accession, he chose as his colleague his brother, Valens (q. v.), to whom he resigned the government of the East, reserving for himself Illyricum, Italy, the Gauls, Britain, Spain, and Africa. During V.'s reign the utmost vigilance was required to preserve the frontier districts of the empire from the ravages of the swarms of barbarians who, like vultures, had gathered round their prey, watching with greedy eagerness the rapid decay of its strength, and ready at the first opportunity to hasten its impending doom. The Alemanni repeatedly (366—368) ravaged the east, and the Saxons (370) the north-east of Gaul; Illyricum was wasted (370) by the Quadi, and Africa by the southern desert tribes; and though these invasions were mostly repelled and revenged in a manner becoming the warriors of the queen of nations, the auxiliary means often had recourse to (e. g., the assassination of two powerful and able opponents, the kings of the Alemanni and Quadi, and the treacherous attack on the Saxons while under the fancied security of a treaty), surely indicated that the sturdy virtue which formerly imbued the soldiers of the empire was rapidly disappearing. The internal administration was excellent, for the emperor added to his ability, prudence, and firmness of character, the less common imperial qualities of vigilance and impartiality; and his cognizance of any abuse or injustice by whomsoever perpetrated, was the signal for its speedy rectification, and the severe punishment of the offender. Though himself a zealous Catholic, he repelled the solicitations of the bishops who wished him to interfere in the religious disputes of the time, permitted his subjects to adopt whatever religion they chose, and strictly forbade all persecution or annoyance on account of religious belief, even maintaining the 'pontifices' of the provinces in the privileges which they had possessed under Julian. On account of the scandalous abuse by ecclesiastics of their influence over their penitents, he excluded priests and monks from the right of succession to property; judicial proceedings were forbidden to be held in private; the extreme licence of speech hitherto allowed to advocates was judiciously restrained; gratuitous medical attendance was provided for the poor of Rome; and schools were established throughout the empire. The success of V.'s administration was doubtless much owing to his fortunate choice of officers: Theodosius the Elder in Africa and Britain, Jovinus in Gaul, and Theodosius the Younger (afterwards emperor) in Illyricum, form a trio distinguished by an unswerving loyalty, administrative ability, and military talent, rarely found in any age; and contrast strongly with their predecessors in office. V.'s private life was a model of morality and economy, and according to the summation of the accurate and trustworthy Ammianus, 'he had so many good qualities, that if everything had been equal in him, he would have been another Trajan or Marcus Aurelius.' But the one and grievous fault which marred his character was an ungovernable temper, which led him into the occasional commission of excessive cruelties, and ultimately caused his death; for while giving audience to the deputies of the Quadi, with whom he was then at war, he worked himself into such an access of passion as to rupture a blood-vessel in his chest, and fell back dead into the arms of his guards, November 17, 375. By his first wife he had one son, Gratianus (q. v.); and by the second Justina, another son, Valentinian, and three daughters, one of whom, Galla, became the wife of the Emperor Theodosius I.—VALENTINIANUS II., the younger son of the preceding, was born 372 A. D., and received from his elder brother, Gratianus (q. v.), the provinces of Italy, Illyricum, and Africa, as his share of the Western Empire. During his long minority, the Empress Justina administered the government; and about three years after her death, V., who had given promise of good administrative qualities, was murdered by the Frank, Arbogastes, the commander-in-chief of his army, May 15, 392.—VALENTINIAN III., the grand-nephew of the preceding, being the son of Constantius III. by Placidia, the daughter of Theodosius the Great and Galla, was born about 419 A. D., and was seated on the throne of the West by Theodosius II., emperor of the East, 425 A. D. V. was a weak and contemptible prince, nevertheless his reign is one of the most interesting epochs of Roman history, exhibiting, as it does to the full, the internal weakness and corruption of the empire, the gradual closing with it of its irresistible barbarian foes; the sad picture being momentarily lightened from time to time with a flash of the warrior-spirit of old Rome. V. may be said never

to have ruled during the 30 years that he sat disesteemed and unhonoured on the imperial throne; his mother, Placidia, governed till her death in 450, and was succeeded by the eunuch, Heraclius, one of those malignant fribbles who swarmed around the throne of the falling empire. The regulations enacted for the internal administration were creditable, and especially so when ecclesiastical interests were involved. as in almost all cases, the ambitious and persecuting tendencies of the now preponderant orthodox party, were firmly restrained; while, on the other hand, the fierce vindictiveness of its more bigoted rivals was kept within bounds. But the utter corruption of manners, the complete extinction of 'public spirit,' the oppressive exactions of the tax collectors, and equally of the commissioners who were appointed to prevent these exactions; the general employment of the powers of the executive in the avenging of private quarrels, and the utter impossibility of obtaining redress for injuries, too plainly shewed that the empire had fallen far beyond remedy, and that if not destroyed by assailants from without, it would speedily crumble to pieces of itself. The early part of V.'s reign was disturbed by the contests between the 'comites' Boniface and Aëtius, the former of whom had supported, and the latter resisted V.'s claims to the throne; but notwithstanding this, the vile and groundless calumnies of Aëtius prevailed upon the empress to declare the gallant and upright governor of Africa a public enemy; and the latter, in the first flush of resentment, called to his aid the Vandals under Genseric (q. v.). Thus Africa was lost to the empire. But Aëtius, notwithstanding, proved himself the invincible bulwark of the Roman power in Europe; the Franks, Goths, Burgundians, and other German nations who had encroached on the empire, were successively defeated and repelled, and the destructive career of the formidable Huns brought nigh to a close on the field of Chalons. Yet the labour of defending an extensive empire from attack on all sides was too much for one man; and consequently, much of Spain and Gaul was ultimately seized by the Suevi and Visigoths, the north of Italy was ravaged by the Huns, Sicily and Sardinia by the Vandals, and even Rome repeatedly besieged, while Britain was abandoned to the wild Picts and Scots. Aëtius seems to have committed the same error as his more upright and noble, though not more able, predecessor Stilicho (q. v.), in attempting, by the marriage of his son to V.'s daughter, to transfer the imperial dignity to his own family, and like him also, undermined in influence and reputation by the machinations of a eunuch, he was assassinated, though by the sword of his master (454). In the following year, V., who had ravished the wife of his intimate friend Maximus, was conspired against by the friends of the latter, and the faithful adherents of Aëtius, and murdered in the midst of his guards, March 16, 455.

VALE'NZA (*Valentia Valentinum Forum*), a city of Northern Italy, on an elevated plain, on the right bank of the Po, eight miles north of Alessandria. It is very regularly built, and commands a fine view of the surrounding vine-clad hills. It carries on a trade in wine, and manufactures of silk, flax, and hemp fabrics. Pop. 9612.

V., a very ancient town, belonged to the Liguri, and was conquered by Marcus Fulvius, the proconsul, who named it *Forum Fulvii, quod Valentinum*. In 1635, it was besieged for 50 days by the armies of France, Savoy, and Parma, and taken. In 1707, it came into the possession of Victor Amadeus II., Duke of Savoy; in 1805, the French destroyed its gates and fortifications; and in 1815, after the fall of Napoleon's empire, it reverted to the king of Sardinia.

VALE'RIAN (*Valeriana*), a genus of plants of the natural order *Valerianaceæ*, an order of exogenous plants, containing nearly 200 known species, natives of temperate climates, chiefly of Europe, the mountainous parts of India, and South America; annual or perennial herbaceous plants with opposite leaves, destitute of stipules, and small flowers in cymes. They are nearly allied to *Dipsacaceæ* (see TEASEL), but differ in the mode of inflorescence, and in the seeds being destitute of albumen. The fruit also is not simply 1-celled, but exhibits two other abortive cells, and the stamens are 1—5, the stigmas 1—3. The corolla is sometimes spurred.—The genus *Valeriana* is distinguished by a pappus-like calyx, a spurless corolla, and three stamens. The species are pretty numerous. The common V. (*V. officinalis*) is abundant in ditches, moist woods, &c. in Britain and throughout Europe. It has a fleshy root, pinnatifid leaves, a stem 2—4 feet high, and pale flesh-coloured flowers. The root is a well-known medicine, used both by physicians and as a domestic remedy in spasms, epilepsy, hysteria, and other nervous affections. It possesses powerful antispasmodic properties, and a very considerable influence over the nervous system. Cats are very fond of it, and it exercises a remarkable stimulating and intoxicating power over them.

Valeriana officinalis.

Although the plant grows chiefly in damp soils, the root is most powerfully medicinal in dry hilly ground.

The roots should be collected in autumn; and those from wild plants growing on a dry soil are preferred. The chief ingredients of valerian are woody fibre, resinous and gum-like matters, and a little more than 1 per cent. of a volatile oil, which is crystallisable, and has been termed *valerole*, and in which a well-known acid (also obtained from several other sources), *valerianic* or *valeric acid*, is developed on exposure to the air. Valerian imparts its therapeutic properties, which are those of a stimulating antispasmodic agent, both to water and to alcohol. There are three officinal preparations—viz., the *Infusion*, the *Tincture*, and the *Ammoniated Tincture*. In large doses, valerian produces considerable disturbance of the nervous system, as headache, vertigo, and even temporary blindness. In average doses—as, for example, in from one to two ounces of infusion, and from half a drachm to two drachms of either of the tinctures—it is a very efficacious remedy in those severe cases of hysteria which closely simulate epilepsy, and in chorea. As some of the salts of valerianic acid—viz., the valerianates of soda, zinc, ammonia, iron, and quinine—act similarly to and with more certainty than the above-named preparations, we may infer that the therapeutic action of the remedy is solely due to the acid; and as the infusion and tinctures are by no means agreeable medicines.

they will probably soon be replaced by the valerianates.

The SMALL MARSH V. (*V. dioica*), also a native of Britain, is much less powerful than the common species.—The greater V. (*V. Phu*), which grows in alpine districts of the continent of Europe, is now almost entirely disused, although it is said to be one of the strongest of the European Valerians, a pre-eminence which *V. Dioscoridis* disputes with it.—*V. Celtica* and *V. Saluinca* are gathered near the limits of perpetual snow on the mountains of Styria and Carinthia, and carried into Turkey and Egypt, and thence into India and Ethiopia, to be used to aromatise baths, and as a substitute for SPIKENARD (q. v.).—*V. Sitchensis*, a native of the north-west of America, is said to possess the medicinal properties of the genus in great perfection. *V. Hardwickii* is used medicinally in Nepaul.—The root of *V. edulis*, a species found in the north-west of America, is an article of food of the Indians.—Corn Salad (q. v.) or Lamb's Lettuce belongs to the order *Valerianaceæ*.

VALERIANE'LLA. See CORN SALAD.

VALERIA'NIC or **VALERIC ACID** is one of the volatile fatty acids represented by the general formula $C_nH_{2n}O_2$. The composition of valeric acid is represented by the formula $C_5H_{10}O_2$; and amongst its chief properties it may be noticed that it is a limpid, colourless, oily fluid, of a penetrating odour, allied to that of valerian root, and an acrid taste. It renders paper transparent, but the spots disappear on exposure to the air. Its specific gravity is 0·94, it boils at 347°, and may be distilled without change; and its vapour is inflammable. It is only slightly soluble in water, but dissolves in alcohol and ether in all proportions. It exists in and is obtained by distilling valerian root with water acidulated with sulphuric acid. It may be similarly obtained from angelica root, and some other vegetable sources. It is also formed during the oxidation of fats and fatty acids (especially oleic acid), either by nitric acid or mere exposure to the air, by the oxidation and putrefaction of the albuminates, &c.; but the best method of procuring it is by distilling a mixture of amylic alcohol (or fousel oil) with bichromate of potash and sulphuric acid.

The salts of valerianic acid—the valerianates or valerates, as it is now becoming the fashion to call them—are formed either by saturating the base or its carbonate with the free acid, or by double decomposition, their general formula being $MC_5H_{10}O_2$, when M is any metal. The alkaline valerianates are very soluble, and are not easily obtained in crystals; but most of the other salts occur in nacreous scales, and all of them, when moist, have the smell and taste of valerian.

The following salts are used in medicine: *Valerianate of sodium*, which is included in *Pharm. Br.*, and *Valerianate of zinc*, which is also included in *Pharm. Br.* and occurs in brilliant white pearly tabular crystals, with a feeble odour of valerianic acid and a metallic taste, is scarcely soluble in cold water or in ether, and insoluble in hot water and alcohol. Besides these officinal salts, the valerianates of ammonium, of iron, and of quinine are employed in the same cases as the preparations of valerian, the doses averaging from half a grain to three or four times that amount three times a day in pills, except in the case of the ammonia salt, which is best given in solution. *Valerianate of oxide of amyl* ($C_5H_{11},C_5H_{10}O_2$) is a volatile fluid with a penetrating odour of apples, boiling at about 360°, slightly soluble in water, but dissolving freely in spirit and in ether. In the form of a dilute spirituous solution, it so strongly resembles apples in its smell, that it is used in perfumery under the title of *oil of apples*.

VALERIA'NUS, P. LICINIUS, Roman emperor, was descended from an ancient and noble family, and after distinguishing himself in the various posts which he was selected to fill by masters who appreciated his talents and virtues, was chosen for his integrity and accomplishments to the office of censor. Faithful in his allegiance to Gallus, he went to summon the legions of Gaul and Germany to aid the feeble emperor against the usurper Æmilianus, but arrived too late to save his master. The usurper's troops, awed by the superior numbers of V.'s army, and the stern sanctity of their leader's character, murdered their own chief, and united with their late antagonists in proclaiming V. emperor, 253 A.D. V. was then about 60 years of age, and feeling his inability to sustain, unaided, the cares of empire, assumed as colleague his eldest son, Gallienus (q. v.). V. shewed abundant proof during his short reign of most ardent zeal for the prosperity of the empire; but the times required a ruler of more energy and ability; as the grave disturbances which arose throughout the empire, the irresistible irruption of the Franks into Gaul, despite the utmost efforts of Aurelian (q. v.), the devastation of Thrace, Macedonia, Greece, and the Archipelago by the Goths, the advance of the Alemanni to Milan, and the conquest of Syria and Armenia by Shapur, amply testified. The troubles in the East appearing most threatening, V. went thither in person, and for some time fortune favoured his standard; but pursuing his opponents too rashly, he was suddenly attacked by superior numbers at Edessa, completely defeated, and himself, with the remnant of his army, forced to surrender, 260 A.D. The statements regarding the indignities heaped upon the unfortunate captive by his haughty conqueror, are probably false, or, at least, much exaggerated; but of one thing we are assured, that V. languished till death in hopeless captivity; and after his death, his skin was flayed off, stuffed, preserved as a proud trophy of victory, which was invariably exhibited to the ambassadors from Rome to the Sassanide court.

VALE'TTA, an important fortress and beautiful city, capital of the island of Malta, on the north-east side of which, in lat. 35° 53′, long. 14° 31′, it is situated. It occupies a tongue of land, which runs out in a north-east direction, is 3200 yards long, and generally about 1200 yards across, except at the extremity, where it narrows considerably, and forms the famous Point of St Elmo, on which are a powerful fort and a light-house. From this Point to its landward end, the neck of land, which is well named the 'Hog's Back,' rises gradually; and there is a downward slope from the central ridge to the Great Harbour on the right, and to the Marsa-Musceit, the quarantine harbour, on the left. Eight principal streets traverse the peninsula, and are intersected by cross-streets, that pass over the central ridge, and afford communication from harbour to harbour. These cross-streets are necessarily very steep at the extremities, where they rise from the shores by long flights of stairs. The town and harbours are defended by a series of fortifications of great strength. They are mostly hewn out of the solid rock, and, mounted with the most powerful artillery, are considered impregnable. The city is divided into five quarters—the *Citta Nuovo*, or Valetta Proper, Floriana, Vittoriosa, Sanglea, and Barmola. Besides the enormous forts, balconies, and battlements, which are the principal architectural characteristics of the city, V. contains

many noble edifices. The governor's palace—formerly that of the Grand Masters—is unadorned without, but magnificent within, and possesses an interesting armoury; the 'con-' (i. e., joint) cathedral of St John is a superb structure; and the church of San Pubblio, with its famed *sotteraneo* (vault) of embalmed monks and skeletons; the public library, 60,000 vols.; the university; and the aqueduct, which brings water to the city from the far side of the island, a distance of 8¾ miles, are worthy of notice. The city was founded by the Grand Master Valette—from whom it derives its name—in 1566. V. is the centre of the commerce of the island, for which, as well as for the principal historical incidents with which its name is associated, see MALTA. Pop. upwards of 60,000.

VALETTE, JOHN PARISOT DE LA, a Grand Master of the Knights of St John, celebrated for his gallant defence of Malta against a powerful fleet of the Turks, which must be regarded as mainly instrumental in checking the westward progress of the arms of Solyman the Great, long the terror of Europe and of Christendom. La V. was born of a noble family, in 1494; and at a very early age entered the order of St John, in which he soon distinguished himself by his enthusiastic bravery and his skill in arms. His chief distinctions, even in youth, were won in the naval service in the Mediterranean, where the Turkish power was especially formidable. On the death of Claude la Sangle, Grand Master of the order, La V. was elected to that office, being the 48th in the list of the grand masters. Still directing the energies of the order in the same course, he succeeded, within the first five years of his Grand-mastership, in capturing 50 great galleys from the Turks, and an immense number of smaller vessels of war; a success which so stirred the indignation of the sultan, that he resolved on the capture of Malta, and the destruction of the Knights. Accordingly, on the 18th May 1565, an immense fleet, of 159 ships, conveying a body of 30,000 janizaries and spahis, appeared off the harbour of Malta, and after failing in several assaults, formally invested the island. Alone and unsupported by any of the Christian powers, the gallant La V. maintained the fortress under circumstances of extreme difficulty and distress of every kind; and when, all further resistance seeming to be hopeless, he was urged to capitulate, his reply was, that the life of a worn-out soldier of 71 years could not be better spent than in such a service. At last, at the end of four months, and after a loss, it is said, of 20,000 men, the Turkish fleet was forced to raise the blockade and withdraw from the island. La V. died three years later, August 21, 1568.—There is another LA VALETTE, a father of the Jesuit Society, who obtained a very different sort of notoriety in the latter half of the 18th century. Having engaged, contrary to the prohibition of Benedict XIV., as a trader in the products of the large estates held by the Jesuits in the Philippine Islands, and being unable, in consequence of the capture of his ships by an English privateer, to meet his engagements, a suit was commenced in the French courts against the French province of the Society, the proceedings in which suit were among the causes which precipitated the expulsion of the Society from France, and its eventual suppression by Clement XIV. See JESUITS.

VA'LGUS is a term employed in Surgery to designate a variety of Club-foot (q. v.). The corresponding Latin word signifies 'having legs bent outwards, bow-legged,' and is probably derived from *volvo*, 'to turn or twist.' As it is an adjective, the substantive, *Talipes* (an unclassical word, indicating 'weakness of the feet,' but in surgical nomenclature signifying 'club-foot') must be regarded as understood.

VALLA, LAURENTIUS, one of the first scholars of the Renaissance, was born at Rome in 1415, taught classics in various places in the north of Italy; but in 1443, on account of his assaults on the scholastic philosophy, and his defence of Epicurus, found it advisable to seek protection at Naples from Alfonso V. Here, however, he soon fell under a suspicion of heresy, and was, it is said, dragged for punishment before the Inquisition. Aided by the king, he made his escape, and fled to Rome, where Pope Nicholas V. pardoned him, received him into favour, and appointed him papal secretary and canon in the church of St John Lateran. He died 1465. V.'s Latin translations of Herodotus (Par. 1510) and Thucydides (Lyon, 1543) are admirable, and had a great influence in spreading a knowledge of classic history; but the work that brought him most renown was the *Elegantiæ Latini Sermonis* (6 books; Rome, 1471), which long served as a model in style to Latinists. From 1471 to 1536, no fewer than 59 editions of it appeared. It has passages of noble eloquence in praise of the glorious tongue of Rome, through which one discerns a passionate desire for the unity of Italy—ever an honourable characteristic of Italian scholars and writers. The *Elegantiæ* is, moreover, full of nice grammatical observations, particularly on synonyms. V. has also the credit of being the first of the Renaissance scholars that used his classical culture in the criticism of the New Testament (*Annotationes in Novum Testamentum*, published by Erasmus). In his *De Donatione Constantini Magni*, he demonstrated the historical groundlessness of the pretended 'Donation' of Constantine, and inveighed against the popes for their grasping after temporal power; but this he was forced to retract. A collected edition of V.'s works appeared at Basel in 1543.

VALLABHA AND VALLABHÂCHÂRYAS. See under VAISHN'AVAS.

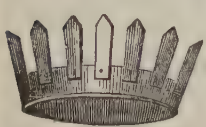
VALLADOLI'D, a famous city of Spain, sometime capital of the whole country, and still capital of the province of the same name (see CASTILE), stands on a wide, wind-blown plain on the left bank of the Pisuerga, 150 miles north-west of Madrid by railway. It is 2100 feet above sea-level, and has a healthy climate, the air being pure and genial, and the sky generally cloudless. Having been the residence of the court prior to its removal to Madrid at the close of the 16th c., the city contains many large and decayed dwellings; although, with the returning prosperity of the town, new mansions are being erected, and the streets are being paved, enlarged, and multiplied. In the Plaza de Campo, the site of famous tournaments, *autos-da-fé*, decapitations, and bull-fights, Napoleon reviewed 35,000 troops. The Plaza de Toros, or bull-arena, can accommodate 10,000 persons. The Museo, which contains such of the statues, carvings, and sculptures as could be collected at the suppression of convents in the province, is an elegant building, containing a grand saloon, six rooms filled with pictures, and three with sculptures. Of these treasures, the sculptures are the most valuable, though among the pictures are several by Rubens. Near the Palacio Real (royal palace), are the remains of two of the noblest Gothic religious edifices in the world, the convent of San Pablo and the Colegio de San Gregorio, both richly and beautifully decorated, but much damaged by the French soldiery. V. is admirably situated for trade and manufactures. There is abundant water for irrigation, and the

surrounding district is remarkably fertile. It communicates with the Atlantic by the Douro, and with the middle and south of Spain by canals and railways. Manufactures are springing up in the city; the soil in the vicinity is being improved by companies instituted for that purpose; and in other respects, V. gives tokens of revival. Silk, cotton, and woollen stuffs; jewellery, hats, paper, perfumery, &c., are manufactured. Pop. about 45,000.

V., the *Pincia* of Ptolemy, is first mentioned under its present name in 1072. Charles V. erected many splendid edifices here; and his son, Philip II., born here, gave his native town the title of city in 1596. About this time, V. was the most prosperous city in Spain—contained 100,000 inhabitants; was the usual resort of foreign princes, and of the great artists Berruguete, Juni Herrera, &c.; and boasted a university. In 1560, Madrid was declared the only court; and from this time the prosperity of V. declined.

VALLADOLI'D, a town of Mexico, in the state of Yucatan, 90 miles east-south-east of Merida, stands in the midst of a highly cultivated tract of country. It is the best constructed and the healthiest town in Yucatan, and the seat of cotton manufactures. Pop. 15,000.

VA'LLARY CROWN (Lat. *corona vallaris* or *castrensis*), a crown bestowed by the ancient Romans as an honorary reward on the soldier who first surmounted the outworks, and broke into the enemy's camp. It is in form a circle of gold with palisades attached, as in the above figure. The crown vallary occasionally occurs as a heraldic bearing.



Vallary Crown.

VALLEY, a hollow tract on the earth's surface between hills or mountains. Valleys are generally parallel to the direction of the ridges of elevated ground; but some are transverse, cutting through the mountain-chain. They have a watercourse at or near their lowest level. The main valley is that which has the river of the drainage-system to which it belongs flowing through it, while the tributary streams which feed this river flow through lateral valleys. The terms upper and lower valley define parts of the same valley, as related to the source or to the mouth of the river which flows through it. In a narrow valley, the river always occupies the lowest part; but in wide valleys, especially in those in which waters run that are largely charged with sediment, the river often builds up a channel for itself, that is higher than the ground at the foot of the hill. The river, in its floods, bears a large amount of mud, which it continues to carry as long as the water is retained within its bed; but whenever it overflows its banks, the velocity is reduced, and the heavier particles, which form the bulk of the sediment, are deposited near the river's course; while, flowing over the surface of the level ground, even the finer particles fall to the bottom, until, as it reaches the limits of the valley, the water gradually becomes clearer. The Rhine, the Nile, and indeed almost all great rivers in wide valleys, illustrate this phenomenon. The river seldom flows through the middle of the valley, but is generally nearest to that side where the slope to the high ground is steepest; the opposite side of the main valley presenting a more gradual rise to the mountain summits, supplies the chief lateral valleys and feeding-streams to the river.

The origin of valleys has been a subject of considerable controversy, and this question is even now occupying the attention of geologists. At the time when a universal deluge was used to explain whatever was inexplicable in geology, it was considered to have been the agent which furrowed the earth's surface with valleys; and this opinion was entertained so lately, as to have been advocated by the late Dean Buckland in his *Reliquiæ Diluvianæ*, until Professor Fleming shewed the untenableness of these opinions.

At the present day, geologists are very much divided as to the origin of valleys. Some hold that they are the result of the operation of that internal agency which has, at different periods, so broken the crust of the earth, and changed its surface; while others maintain that various agents now operating more or less favourably in disintegrating and removing the solid materials of the exposed portion of the surface of the earth, produced the inequalities that now exist. There can be no doubt that all these have been active, and that the special advocacy of individual agents, as the sole producers of these phenomena, is the source of error, and the cause of controversy. Each and all have done their part; and in a satisfactory explanation, they must all be taken into account. That internal force has been a principal agent in producing the diversity of hill and valley, seems beyond doubt. This force acted by raising the surface perpendicularly from below upwards; by producing great faults, which presented facilities for the action of running water; or by pushing a portion of the crust forward, so as to produce immense folds, alternating with mountain ranges. The Appalachians of North America, and the associated valleys, have been produced, as has been shewn by Professor Rogers, by the last-mentioned method; and the Tertiary strata of the Alps were carried up a thousand feet, while the valley-beds of the Adriatic and the Mediterranean either remained stationary or subsided to a lower level. The fact that some valleys are only the synclinal axes between the bounding mountain systems, like the basin of Switzerland between the elevated ridges of the Alps and Jura, also confirms the opinion that some valleys owe their origin to the operations of an internal force, which operated in geologic ages in a more powerful manner than it has been known to do in historical times. In the face of such facts, it is surprising to hear practical geologists so influenced by pet theories as to assert that the action of internal force has 'no direct effect on the external features of the ground.' But this is the position of men who adhere to the strict Lyellian doctrine, that all the past changes on the earth's surface have been produced by agents now operating, and at the same rate, but through enormously protracted periods of time. But as these agents are various, so we have almost as many theories as there are agents. Lyell insists that ocean-currents, and the wear and tear of the waves, have produced the inequalities. Jukes will have it that the atmosphere has disintegrated, and the rivers carried off the materials which formerly filled up the hollowed-out valley to a level with the surrounding hills; while Ramsay declares that glaciers were the important agents in the process. That any one of these alone has produced the great changes on the surface of the earth, is a position that would be maintained only by those who are blinded by their idol of a favourite hypothesis which they have to defend. But that all of them, in addition to the operation of an internal force, have been agents, more or less, in producing the present conformation of the earth's surface, cannot be doubted. While the advocates of superficial agents so completely ignore the influence of internal force, as in the statement of Professor Jukes quoted, those who

maintain the opposite view are equally open to condemnation when they declare that the wear and tear due to atmospheric sub-aërial erosive agency never could, even after operating for countless ages, have originated and deepened any of the valleys which occur in flat countries.'—Murchison's Address at British Association, 1865.

VALLISNERIA, a genus of small, stemless, aquatic plants, with grass-like leaves, belonging to the natural order *Hydrocharideæ*, and found in the warm parts of both hemispheres. They generally grow in running waters. *V. spiralis* is particularly celebrated on account of its peculiar process of

Vallisneria spiralis:
a, female plant; *b*, male plant.

fecundation. At the time when this is to take place, the flowers of the female plants rise to the surface of the water by means of their long spirally-twisted stalks. The flowers of the male plants, in order to follow them thither, become detached, having previously grown on short spikes at the bottom of the water, and expand, floating about upon the surface. After fecundation, the female flowers return under the water by the spiral contraction of their stalks, and the fruit is ripened under water. It is found in ditches in Italy and France, and in the slow rivers of the Atlantic United States.

VALLOMBROSA, a celebrated abbey of Tuscany, situated among the Apennines, in a valley surrounded with forests of fir, beech, and chestnut-trees (hence the name, meaning 'shady valley'). Here an order of monks according to the rule of St Benedict was founded about the middle of the 11th c., who were called Vallombrosians from the name of the site, or Grey Monks, from the colour of their habit, which, however, was afterwards changed to black. They were the first to admit lay brethren. The monastery became very wealthy through donations, and the present magnificent buildings were erected in 1637. It formed a refuge for priests during French rule in Italy. After 1815, the monks resumed possession, but in very diminished numbers; and their duties are few beyond those which attach to the charge of the sanctuary, and the care of pilgrims and other strangers. The monastery and its highly picturesque environs are still much visited.

Vallombrosa was visited by Dante, celebrated by Ariosto in the *Orlando Furioso*, canto xxii., and is mentioned by Milton in the *Paradise Lost*.

VALLS, Spain. See SUPPLEMENT in Vol. X.

VALMY, a French village in the dep. of Marne, 20 miles north-east from Chalons. In 1792, the Prussians, under the Duke of Brunswick, after capturing Longwy and Verdun, were advancing towards Paris driving the army of Dumouriez before them, when Kellermann (q. v.), who commanded the army of the Rhine, learning the critical situation of his comrade, hastened to his relief with 22,000 men, and taking up his position on the heights of Valmy, awaited the advance of the Prussians. These, possessing themselves of the heights of La Lune, immediately opened a vigorous cannonade on the French, to which the latter effectively replied. The explosion of two ammunition-wagons within the French lines having thrown them into disorder, a body of Prussians, taking advantage of the confusion, advanced to the attack; but the energetic conduct of Kellermann, and the enthusiasm infused by him into his troops, restored their steadiness, and by a sudden charge with the bayonet, the Prussians were made to retire to their former position. This battle, or rather skirmish, frequently alluded to as the *cannonade of Valmy*, did not cost either army more than 800 men, but though, in a military point of view, an insignificant affair, it produced moral effects of the greatest importance. It was the first triumph of the republican arms, and with characteristic impulsiveness, the French were transferred from the depths of despair to the very pinnacle of self-confidence. When Napoleon was creating his 'noblesse,' this great service rendered to France by Kellermann was fitly remembered by his nomination as *Duc de Valmy*.

VALOIS, HOUSE OF, a branch of the dynasty of the *Capetiens* (q. v.), which possessed the throne of France from 1327 till 1589, originated in the person of Charles, second son of King Philippe III. (*le Hardi*), who obtained in 1285 the county of Valois in appanage from his father. Previously, the county of Valois had been possessed by a cadet branch of the great House of Vermandois; but on the union of the heiress of Vermandois with Count Hugh the Great, the younger son of King Henry I., and the failure of their descendants in the end of the 12th c., the Vermandois possessions, including Valois, were annexed to the French crown, till again separated in 1285, as above mentioned. But Philippe IV., the elder brother of Charles, having left three sons, who reigned in succession, and died without issue male, the succession fell, by the Salic law, to the eldest son of Charles, who accordingly ascended the throne as PHILIPPE VI. (q. v.). The elevation of the House of V. to the throne of France gave rise to long and bloody wars with Edward III. of England, who claimed the crown through his mother, Isabel, the daughter of Philippe IV., insisting that the Salic law only prohibited the 'succession' of females, and did not deny their capacity for transmitting a claim to the crown. But if Edward III.'s argument had been sound, it would have destroyed his rival's claim without benefiting himself, for the real heirs to the throne would have then been the Navarrese royal family, who were descended from the eldest daughter of Louis X. Edward, nevertheless, assumed the title of *King of France*, an example followed by all his successors till George III., and maintained his claims by force of arms till, by the mediation of the pope a partition of the kingdom was effected. The French crown fell, by regular succession of son to father, to JOHN THE GOOD (1350—1364), CHARLES V. (1364—1380), CHARLES VI. (1380—1422), CHARLES VII. (1422—1461), LOUIS XI. (1461—1483), and CHARLES VIII. (1483—1498), under the first four of whom the contest with England was carried on with spirit, at first to the advantage of the English, but latterly of the French, who, under Charles VII., succeeded in driving the English from all their strongholds, Calais alone excepted. Charles VIII. having died without leaving male issue, the crown fell to the representative of the nearest collateral male line—that is, to Louis, son of Charles, Duke of Orleans, and grandson of Louis, Duke of Orleans, the younger brother of Charles VI., who ascended the throne as LOUIS XII. (1498—1515), the first of the Valois-Orleans *régime;* but he also dying without

male issue, the succession devolved upon the descendants of his uncle, Count Jean of Angoulême, whose grandson, FRANCIS I. (1515—1547), next obtained the sceptre, which he transmitted to his son, HENRY II. (1547—1559). Henry's three sons, FRANCIS II. (1559—1560), CHARLES IX. (1560—1574), and HENRY III. (1574—1589), occupied the throne in succession; but none of them leaving lawful male heirs, and all the collateral male lines proceeding from Philippe III. having become extinct, the crown passed to the House of Bourbon (q. v.), which was descended from his younger brother, Robert.

The most distinguished cadet branches of the royal line of V. were, the ducal family of Anjou, which long contested with the Aragonese royal family the possession of Naples; the last and most celebrated ducal House of Burgundy; and the illegitimate line of Dunois and Longueville, which was so productive of eminent warriors and daring politicians.

The V. monarchs of the elder line were a succession of able rulers, who, by valour and policy, wrested France from the hands of the English, and firmly established the royal authority over their powerful, proud, and turbulent nobility; those of the younger, or *Valois-Orleans* and *Valois-Orleans-Angoulême* lines were, with the single exception of Francis I., a series of weak princes, under whose feeble rule the country was distracted by contests for power between rival nobles, and religious dissensions among the people at large, though, owing to the number of able men on whom devolved the cares of government, the country suffered less from the incapacity of its monarchs than might have been expected.

VALO'NIA, an article very extensively used by tanners, in consequence of the large quantity of tannic acid which it contains. It is the acorn-cup of a species of oak (*Quercus Ægilops*), indigenous to Asiatic Turkey. It is very largely imported into Great Britain from Smyrna and the Greek Isles; as much as 40,000 tons have been imported in one year, its value being about £14 per ton.

VALPARAI'SO, the most important trading-town of Chili, South America, is situated in the province and on the bay of the same name, about 90 miles west-north-west of Santiago (q. v.), with which it is connected by railway. It is chiefly built on a narrow strip of land, at the head of the bay. It contains theatres, colleges, hospitals, and a number of scientific and literary institutions; its streets, though narrow, are well paved; and its houses, almost all two stories high, are gaily painted, and furnished with balconies. The picturesque Bay of Valparaiso, which is generally crowded with ships, is sheltered from all quarters except the north; and in the winter months, when northern gales prevail, the anchorage is considered dangerous. In 1822, the town was nearly destroyed by an earthquake; and on several occasions since that time, its progress has been checked by the same cause: in spite of this, however, V. has made great progress within recent years, its pop. having increased from under 10,000 in 1825, to about 95,000 in 1883. Three forts and a water-battery defend the bay. Nearly 3000 vessels, of about 700,000 tons, enter and clear the port annually; the imports, which amount in value to about $17,000,000, being chiefly cotton, silk, and woollen goods, hardware, iron, sugar, wines, spirits, tobacco, &c.; and the exports, which value about $9,000,000, being chiefly copper and copper ore, silver, gold, wheat, flour, tallow, hides, and wool. V. was bombarded by the Spanish fleet, March 31, 1866. Few lives were lost, but buildings and other property, the value of which was estimated at from 9,000,000 to 20,000,000 dollars, were destroyed.

VALUA'TIONS OF LAND have been found necessary in order both to regulate liability to taxation, and in feudal times to determine the amount of casualties or occasional profits due by the vassal to the superior. Domesday Book (q. v.) contains the earliest valuation of the lands of England. Valuations were made in succeeding times, when the raising of imposts by subsidies became common, these imposts being apportioned on the people of the realm in respect of their reputed estates. Land was the chief subject of taxation, and was assessed nominally at the rate of 4*s.* per pound. But while land was rapidly increasing in value, the practice grew up of adopting an old valuation, by adhering to which the nominal 4*s.* rate came in course of time to amount to less than 2*d.* per pound. In 1692, it was resolved that a new valuation, correspondent to the existing state of the land, should be made, and a tax levied on all land throughout the realm of 1*s.* per pound, which in time of war was afterwards raised to 4*s.* This impost, called the Land Tax, was made permanent by 38 Geo. III. c. 60, which act also provided the means of enabling it to be redeemed. Though once the most productive of all the resources of the state, the land tax now furnishes a very small fraction of the revenue, and so far as not redeemed, it is still collected on the basis of the valuation of 1692, which has long ceased to be an approximate estimate of the value of land. In the collection of the income tax, the actual value, as annually fixed by commissioners and assessors, is adopted as the criterion.

In Scotland, the contributions levied in the 13th c. seem to have been made with reference to the value of the lands as ascertained, either by some general valuation, or by separate valuations in individual returns. The value as at that period was afterwards known as the *old extent*, or old valuation. In the beginning of the 14th c., land diminished greatly in value in those parts of the country that had been subjected to the ravages of war; and the Scottish parliament, in granting a subsidy to Robert I. of a tenth penny of all the rents of the laity, provided that those lands which had been wasted by the war should be revalued, and that the returns should state both the present value and the former value in time of peace. But in the course of time, as prosperity returned to Scotland, the revaluation, or *new extent*, as it was called, came to be above instead of below the old value; and it became the practice to estimate the new extent by adding a certain proportion of the old valuation, to compensate for the advanced improvement in the country, and the change in the value of money. Under Cromwell, and after the Restoration, in Scotland as well as in England, the mode of taxation adopted was first to name the sum to be raised, and then to distribute it among the counties; and an act of convention of 1667 directed that in apportioning the taxation of each county on the individual landholders, it should be in the power of the commissioners to rectify the old valuations when necessary. The rent established by these valuations is known as the *valued rent*, and continued till 1854 to be adopted for the land tax, and most of the other public and parochial assessments. By a statute of that year (17 and 18 Vict. c. 91), the commissioners of supply of every county, and the magistrates of every burgh, are directed to cause a valuation roll to be made up annually, shewing the rent or value of the whole lands and heritages within the county or burgh, by which roll all local assessments are in future to be

regulated; and provision is made for the appointment of assessors to carry out the act. By 20 and 21 Vict. c. 58, commissioners of supply and burgh magistrates are further empowered to appoint the officers of inland revenue belonging to the county or burgh as assessors; and failing their doing so, the valuations made are not to be conclusive against assessments. The new system of valuation established by these acts is perhaps the most perfect in the world; it possesses the merit of giving universal satisfaction, and is noted for its simplicity.

VALUE, in Political Economy, is one of those terms which demand attention more for the clearing away of its application to vague and fallacious uses, than for an attempt to give it strict scientific definitions. It has a distinct meaning only when it is used as 'value in exchange,' and that between things coexisting in time and place. The measure of such value is the current money of the place. So two articles, each of which will bring £5 in London, are equivalent in value there. Cost has nothing to do with value. If a bale of silk has cost £100, and from disease in the silk-worm, the price of the commodity rises, so that it will bring £150, that is its value. So also if there be a fall, so that it will only bring £75, that is its value. Vain endeavours have been made to establish a permanent standard of value for the purposes of comparing with each other the conditions of people living at long intervals. The changes which affect one thing affect all others; so that comparisons resolve themselves into the nature of fluxions. Money, so effective in estimating contemporary values, is quite useless here. Some years ago, grain, as the necessary of life, was used as a standard of value. It may be an approximate standard, while a people are so poor as to possess little more than the necessaries of life; but when a country becomes so rich that these are but a proportion of the wealth to be estimated, their capacity as a standard is gone.


Vambraced.

VA'MBRACED, in Heraldry (Fr. *avant-bras*, forearm), a term applied to an arm clothed in armour, as in the subjoined crest; a dexter arm embowed vambraced proper, the gauntlet holding a sword below the hilt in bend sinister, point downwards, argent, hilt and pommel or.

VA'MPIRE (Ger. *vampyr*), called also by the Servians *Vukodlak*, and by the Wallachians *Murony*, is, according to the popular belief of the Slavonic, Romanic, and Greek population of the Lower Danube and the Thessalian peninsula, a blood-sucking ghost. In the mythology of the ancient Greeks, beings of a similar nature existed—the Lamias, beautiful phantom women, who, by all sorts of voluptuous delusions, allured youths to them in order to feast on their fresh, young, and pure blood and flesh. And among the Greek Christians there is a belief that the bodies of those who have died in excommunication are kept by the devil in a kind of life; that they go forth from their graves by night and suddenly destroy other men, and also by other means procure food, and thus keep themselves in good condition. They are called Burkolakkä, or Tympanitä; and the only way of escaping from their molestation is by digging up their unwashed corpses and burning them, after the removal of the excommunication. The vampire proper is the illegitimate offspring of parents themselves illegitimate, or the troubled spirit of one killed by a vampire. During the day he lies as a corpse, but turned in his grave, with a florid appearance and warm blood, open staring eyes, and skin, hair, and nails still growing. But by night, especially at full moon, he wanders about in the form of a dog, frog, toad, cat, flea, louse, bug, spider, &c., and sucks the blood from living persons by biting them in the back or neck. If a dead person is under suspicion of being a vampire, his body is disinterred, and if it is found putrid it is only sprinkled with holy water by the priest; but if it is red and bloody, the devil is driven out, and on re-interring it, a stake is driven through the breast, or a nail through the forehead; or it is perhaps burned. The Vukodlaks, who are particularly greedy for the blood of young girls, pair with the Wjeschtitza, a female ghost with wings of fire, which by night sinks down on the breast of the sleeping soldier, presses him in her arms, and inspires him with her fury. As, according to popular belief, every one who is killed by a vampire becomes himself a vampire, an outward sign of the vampire bite usually remains, although not always visible and recognisable by every one; therefore, at the obsequies of every Wallachian, of whatever age or sex, there is always a skilled person, generally a midwife, called in, in order to take precautions against the corpse becoming a vampire. A long nail, for instance, is driven through the skull; it is then rubbed in various places with the lard of a pig killed on St Ignatius's day, and a stick made of the stem of a wild rose is laid beside it. Thessaly, Epirus, and the Wallachians of the Pindus know another kind of vampire still—living men who by night leave their shepherd dwellings, and, roving about, bite and tear everything that they meet, men as well as beasts. The Priccolitsch and the Priecolitschone of the Moldavo-Wallachians, who wanders about more frequently than the Murony proper, is likewise a real living man, who, by night, in the form of a dog, roams over heaths, pastures, and villages; and especially kills cattle and sucks their blood, from which cause he always looks healthy and blooming. Such a man is known by his backbone being prolonged in the form of a dog's tail. Thus, the Vukodlak and the Murony would be something analogous to the nightmare of German mythology; and the Priccolitsch, on the other hand, to the Werwolf (q. v.). The *ghouls* of the Arabs and Persians would seem to be identical with the vampires. In 1725 and 1732 exciting rumours about supposed vampires arose in Hungary and Servia, which resulted in the disinterment of numerous corpses, and caused the publication of a multitude of writings in Germany for and against the matter, among which the most important is Ranft's *Treatise on the True Nature of the Hungarian Vampire*, in which an account is given of all the writings which had appeared on the subject (Leip. 1734).

The name V. has been appropriated to blood-sucking bats. It was erroneously given to bats of the south-east of Asia and Malayan Archipelago, which are really frugivorous. The blood-sucking bats are all South American, and belong to the genus *Phyllostoma*, or SPECTRE BAT (q. v.), and genera nearly allied to it. The true vampires (*Desmodus*) resemble the Spectre Bats; they have a small bifid membrane on the nose, no tail, and the inter-femoral membrane little developed. They have two great projecting, approximate upper incisors, and similar lancet-shaped superior canines, all of which are very sharp-pointed, and arranged to make a triple puncture like that of a leech. There are four bilobiate inferior incisors, the innermost separated by a wide interval; the lower

canines are small; there are no true molars, but two false molars in the upper jaw, and three in the lower, of a peculiar form, apparently unfitted for mastication. The intestine is shorter than in any other mammal, and the whole structure seems to indicate

Vampire Bat.

that blood is the sole food. In some parts of South America, vampires are very numerous, and domestic animals suffer greatly from their nocturnal attacks. They seem to take advantage of an existing wound, but they can also make one. In some parts of Brazil, the rearing of calves is impossible, on account of these bats, and there are districts, chiefly those in which limestone rocks prevail, with numerous caves, in which cattle cannot be profitably kept. Vampires sometimes attack men, when sleeping in the open air; but the stories of their fanning their victims with their wings, whilst they suck their blood, are fabulous.

VAN, a fortified town of Turkey in Asia, stands near the south-east shore of Lake Van, 145 miles south-east of Erzerum. It is overlooked by a citadel, now much dilapidated, but which, from its position on a lofty height, might be of importance. Cotton goods are manufactured, and the bazaars are well stored with the produce raised in the vicinity. V. is always called among the Armenians Schamiramakert—i. e., Town of Semiramis—contains ancient ruins, and cuneal inscriptions are found in which the name Xerxes frequently occurs. Pop. stated at 15,000.—The Lake of Van is a considerable inland sea, 80 miles long and 50 miles in extreme breadth, though the average breadth is not nearly so great. Area, 1200 sq. miles. It is fed by about 8 streams, and has no visible outlet. Its waters are salt, and the only fish caught in it are a kind of sardines, which are salted and exported throughout Asia Minor.

VAN, a species of carriage for merchandise, sometimes covered, and in use for carrying household furniture; in other cases, open and of a lighter nature, used by shopkeepers for sending articles to their customers. Whether large or small, or with four or only two wheels, the van is set on springs, nd it might be called a spring-cart or wagon. The term van seems to be an abbreviation of caravan, which was formerly in use.

VANA'DIUM (symb. V, equiv. 59·2) is a rare metal whose discovery is ascribed by some authorities to Del Rio in 1801 (see art. 'Vanadium' in Watts' *Dict. of Chemistry*), and by others to Sefström in 1830. The last-named chemist found it in a Swedish iron ore, and gave it the name of V., from *Vanadis*, a cognomen of the Scandinavian goddess Freyja. In very small quantities, it is present in nearly all clays; but its most abundant source is the vanadiate of lead, which has been found in Mexico, Chili, and at Wanlockheak in Scotland. The metal is obtained by the reduction of vanadic acid, in the form of a brilliant powder which dissolves readily in nitric acid and aqua regia, forming a beautiful blue solution; but is insoluble in sulphuric and hydrochloric acids, even with the aid of heat. There are five oxides of V., viz., V_2O, V_2O_2, V_2O_3, V_2O_4, V_2O_5. The *dioxide*, V_2O_2, is obtained by the partial reduction of the higher oxides, is a light-grey, crystalline substance like graphite; it does not combine with acids or bases, but when heated in the air for some time it becomes converted into the *trioxide*, V_2O_3, a black powder which, in combination with acids, forms salts having a blue colour. *Anhydrous vanadic acid*, V_2O_5, is of a brownish-red colour, and forms, with bases, colourless, yellow, or red salts, both normal and acid. Of these, the *vanadate of ammonium*, $(NH_4)VO_3$, is the most important, the acid being usually obtained from it. It is stated by Mr Riley, that if vanadic acid be added to water containing tincture of nut-galls, an indelible ink is formed (*The Lancet*, December 19, 1863). It is unnecessary to notice the chlorides and other compounds of V., or to enter at length into the tests for the compounds of so rare a metal. It is sufficient to observe that these compounds, before the blowpipe, with borax in the reducing flame, give a green glass, which becomes yellow in the oxidising flame.

VANBRUGH, Sir John, an eminent architect and dramatist of the 18th c., was the grandson of a Protestant refugee of Ghent, who settled in England during the reign of Queen Elizabeth. V. is supposed to have been born in Chester (in which city his father was a merchant), in the year 1666, and to have been sent to France for his education. His artistic studies were interrupted for some time by his entering the French army, which, however, he left after attaining the rank of captain. On returning to England he must soon have acquired reputation as an architect; for, in 1695, he was made one of the commissioners for finishing the palace at Greenwich for the purposes of an hospital. His first attempt at play-writing was *The Relapse*. It was brought out at Drury Lane with such success, and obtained such popularity, that V. ranked ever after as one of the leading wits and dramatists of his day. About 1697, he wrote his famous comedy, *The Provoked Wife*, for Lincoln's Inn Theatre, where it was produced with even greater success than that which attended *The Relapse*. He then, in partnership with Congreve, started a theatre in the Haymarket, and there brought out his play, *The Confederacy*. But so ill suited was this building for speaking in, that not even the brilliant wit and racy humour of *The Confederacy* could command an audience, and Congreve abandoning the scheme, the theatre had to be closed. In 1702, he erected, for the Earl of Carlisle, the noble palace of Castle Howard, in Yorkshire; and this led to his being employed as the architect of many mansions for the noble and the wealthy in other parts of the country. His reputation was now such that he was commissioned to erect Blenheim House, which the parliament had voted to the Duke of Marlborough; but as no particular fund had been provided for meeting the expenses, and as parliament refused, when applied to, to grant any money for that purpose, the commission was more honourable than lucrative. The queen supplied from her own private purse most of the funds; but after her death, this supply was of course stopped. The Duke of Marlborough having also died, left a specific fund to be expended in meeting the architect's claims; but the duchess not only refused to pay V. his salary, but dismissed him from his office; and the house was completed

under some other management, but from the original designs. After a great deal of trouble, V. managed to get nearly all the money that was due to him; but ever after he was the sworn foe of the Duchess of Marlborough. In 1714, he was made Comptroller of Royal Works. V. died at Whitehall on March 20, 1726, leaving his well-known and popular drama, *The Provoked Husband*, unfinished. His plays can hardly be said to be popular now, their licentious tone and loose morality preventing their being read to that extent to which the brilliancy of their wit, keenness of their satire, and genuine character of their humour would otherwise entitle them. They want the polish of Congreve's dramas, yet, at the same time, they are not infected with the artificiality, stiffness, and laboured brilliancy which disfigure so many of Congreve's best scenes. The interest is well sustained throughout, the characters—such as they are—are real, natural, and racy, the situations striking, and the dialogue brilliant and unflagging. The best edition of them is contained in Leigh Hunt's *Comic Dramatists*, to which is also prefixed an excellent Life of Vanbrugh. His architectural works are still amongst the first of their kind — massive, picturesque, varied in outline, and wonderfully skilful in composition, though a frequent carelessness in the management of details spoils some of his best effects.

VANCOU'VER'S ISLAND, or QUADRA AND VANCOUVER'S ISLAND, an island off the west coast of the Dominion of Canada, belonging to the province of British Columbia, is separated from the main land on the E. by Queen Charlotte Sound, Johnstone Strait, Discovery Strait, and Strait of Georgia, and on the S. from the United States by the Strait of San Juan de Fuca. Lat. 48° 20′—50° 55 N., long. 123° 10′—128° 20′ W. It is 300 miles in length, from 30 to 50 miles in average breadth, two-thirds of which is mountain and barren rock, and is of importance not only from its great natural resources, but also from its geographical position with reference to the commerce of the Pacific, from which the British are in great measure cut off. Area, about 18,750 sq. miles. The main mass of the island is a mountain ridge, which rises in its highest peak, Mount Arrowsmith, to the height of 5900 feet, and whose buttress-like walls descend for the most part abruptly to the shore. There are, however, in many coast-districts, especially on the south-eastern and eastern sides, undulating tracts, thickly wooded in general, but here and there containing patches of open grass-land. The outline of the island is boldly picturesque. The shores are marked by abrupt rocky cliffs and promontories, by pebbly beaches and sheltered coves, with fine harbours. The western shores are gloomy and frowning in aspect, deeply indented by fiord-like arms of the sea, the banks of which are formed by steep rocks, rising like walls. The surface is diversified by mountain, precipice, hill, dale, and lake, and the whole country is more or less densely wooded, except where the mountain summits afford no foothold for plants, or where open grass-lands occur. There are no navigable rivers, and the streams, which are torrents in winter and are nearly dry in summer, are short, and are valuable only as supplying power for grist and saw mills. Springs are numerous, and the water excellent. The climate closely resembles that of Great Britain, subject, however, to modifications traceable to the position of the island. The ocean that washes its shores is throughout the whole year of a remarkably low temperature, owing to the arctic currents that sweep down along the coast, even to the latitude of San Francisco; and westerly winds blowing over the chilled sea-water modify the climate of the island considerably. Again, winds from the south-east, from the snow-covered Olympian Mountains in Washington Territory, are also cold. Owing to these causes, the climate of the island, even so far on as the middle of June, resembles a late English spring—having a clear atmosphere, bright sun, and cold winds. The winter, as a rule, is open and wet; the spring is later and colder than in England, and the summer drier and hotter. The maximum temperature is about 84° Fahr., the minimum about 22° Fahr. The colony is divided into 34 districts, of which 17 had been surveyed, and 7 unsurveyed in 1864. Only a small proportion of the surface is suited for agriculture, four-fifths being little better than barren rock. The crops generally raised are wheat, barley, oats, and peas. The green crops are turnips, mangold-wurzel, vetches, potatoes —which flourish here in unsurpassed excellence— and all sorts of vegetables. Of wheat, the average production is 25 to 30 bushels per acre; of oats, 40 bushels; barley, 40 bushels. Fruit-culture is a profitable branch of industry. Gold is found in increasing quantities; coal is abundant—32,818 tons were exported in 1865 by a single mining company; and copper, silver, lead, and other ores abound. The puma, the bear, and wolf still range in the forests; two kinds of deer are found; there are two kinds of grouse; and snipe and wild-fowl in great variety. Salmon abound. Extensive banks lie about 32 miles off the south-west shore. All of them are well stocked with fish, especially the cod, herring, haddock, whiting, halibut, and sturgeon. A company has been formed to prosecute the fisheries; and there is an extensive market along the west coast of America. Among the valuable woods of the island, the white fir, or Douglas pine, one of the best woods for spars known, is at once the commonest and most important. In some instances, this tree has been known 'to square' 45 inches *for* 90 *feet*. The cedars have an average diameter of 6 to 7 feet, and one has been measured 14 feet in diameter. Ship-building has sprung up, and is an important branch of industry. Victoria, situated at the S.E. extremity of the island, is the principal city, and is the capital of the province of British Columbia. It contained in 1881, 5925 inhabitants, the population of the whole island being about 7000.

The island was first discovered in 1592 by Juan de Fuca, was visited by Captain Cook, 1778, and in 1792 by Lieut. Vancouver, of the British navy. It was secured to Britain by treaty in 1846; previous to 1858, it was held, together with British Columbia, by the Hudson's Bay Company under lease from the crown; in 1865, V. I. and British Columbia were united under one government, and joined the Dominion in 1871.

VA'NDA, a genus of plants of the natural order *Orchideæ*. *V. cærulea*, one of the most beautiful of Indian orchids, is highly prized by cultivators in Britain, and plants are sold at prices of £3 and upwards. It has panicles of azure flowers. Dr Hooker found it on the Khasia Mountains, growing in great profusion, epiphytical upon the oak, banyan, &c.

VA'NDALS (Lat. *Vandăli*, also *Vindili* and *Vanduli*), a famous race of European barbarians, probably of Germanic, though some consider them of Slavonic origin. Procopius, who agrees with Pliny in considering them one with the Goths, states that they originally occupied the country about the *Palus Mæotis* (Sea of Azov), but it would appear that afterwards they migrated to the north-west, and settled south of the Baltic, between the rivers Vistula and Viadus (Oder). They make their first appearance, however, as a historic people in the 2d c. A. D., at which time they inhabited the north-eastern slopes of the Riesengebirge (called after them, *Vandalici Montes*), and figure as the associates

of the Marcomanni and Quadi in the plundering expeditions into Pannonia, and the wars with Marcus Aurelius. In the latter half of the 3d c., they are found in the Roman province of Dacia, along with Goths and Gepidæ. According to Jornandes, the Gothic king, Geberic, annihilated a large part of the nation on the banks of the Maros. The remainder were transplanted by Constantine to Pannonia, where they lived in peace for 60 years. But at the beginning of the 5th c., urged, it is said, by Stilicho, they abandoned their new homes, and in company with the Suevi, Alani, and other German tribes, led by their king, Godegisil, burst into Gaul, which they miserably wasted for the space of three years. Thence they swept through the passes of the Pyrenees into Spain, which experienced a similar fate; and finally, after much quarrelling and fighting with their German associates, they settled in a part of Bætica, which received from them the name of *Vandalitia* (mod. *Andalusia*). In 429, at the call of Bonifacius, governor of Africa, who, from being the most reliable bulwark which the Western Empire possessed, had been driven into rebellion by the false representations of Aëtius (see VALENTINIANUS III.), they crossed the Strait of Gibraltar, under their leader, Genseric (q. v.), in one resistless horde (numbering 50,000 to 80,000 in all), carrying devastation and ruin from the shores of the Atlantic to the frontiers of Cyrene. They were joined by the Donatists (q. v.), a sect of African heretics, and being themselves Arians, they inflicted great cruelties upon the orthodox Christians. Meantime Boniface had discovered the treachery of his rival Aëtius, and set himself, when too late, to remedy the dreadful consequences of his too credulous resentment. He advanced with a small and hastily-levied force, but was defeated with considerable loss, and driven into Hippo (now *Bona*), which he defended for more than 14 months. During the siege St Augustine died, August 28, 430. Boniface, reinforced by a Byzantine army under Aspar, now sallied out upon the Vandals, and a second defeat decided the fate of Africa. In 439, Genseric broke the peace which he had concluded with Valentinian III., in 435, and conquered Carthage. A new peace was established, which recognised the authority of the V. over North Africa from the Atlantic to Cyrene, over the Balearic Isles, Sardinia, Corsica, and part of Sicily. In 455, the V. invaded Italy, and plundered Rome for 14 days. The manner in which they mutilated and destroyed the works of art collected in the city, has originated the application of the term *Vandalism* to all similar barbarism. After the death of Genseric (477), his son, Hunneric, cruelly persecuted the Catholics; warred against the Moorish races in North Africa, who were trying to recover their independence, and kept the Mediterranean in a state of alarm by his piracies. His successors, Guntamund (d. 496) and Thrasamund (d. 523), were comparatively mild and tolerant rulers; the latter was even friendly to literature. But the warm climate, and the love of luxurious pleasure, now began to enervate the spirit of the V.; and the natives, in different parts of Africa, shewed unmistakably that they had ceased to fear them. Thrasamund was compelled to solicit aid from his brother-in-law, Theodoric (q. v.), who sent him a Gothic contingent to help him against the Moors of Tripoli. After his death, Hilderic, a son of Hunneric, became ruler, but he shewed such strong leanings towards Catholicism (owing to his long residence in Constantinople), that his subjects grew discontented, and he was overthrown by his uncle, Gelimer, in 530. This led to the Emperor Justinian sending an expedition, under Belisarius, against Gelimer, in 533. When the latter heard of the arrival of the great Byzantine general he caused Hilderic and his sons to be put to death, but was himself soon after forced to seek refuge in the wilds of Numidia. In 534, he surrendered, was carried to Constantinople in triumph, and ended his life in Asia Minor. Most of the V. were drafted into the imperial army, and 'used up' in the wars with Persia. The few who remained in Africa rapidly disappeared among the natives.—See the various histories of the Roman Empire; also Papencordt, *Geschichte der Vandal. Herrschaft in Afrika* (Berl. 1837).

VANDERVELDE, WILLIAM, commonly called the Elder, in distinction from his son of the same name, was born in 1610, at Leyden. He was bred a sailor; and having a natural aptitude for art, he busied himself in drawings of marine subjects. These becoming known, were seen to be of great merit; and in 1666, he was chosen to sail with the fleet of the famous Admiral de Ruyter, with a view to the commemoration on canvas of his exploits against the English. The sketches which he produced of several engagements which he witnessed procured him a great reputation; and in 1675, he was induced to settle in England, as painter of sea-fights to Charles II., who allowed him a pension of £100 a year. On the death of Charles, his services were retained at the same rate by his successor, James II. He died in London, in 1693, and was buried in St James's churchyard. His works were mostly colourless drawings, of great beauty and precision, many of which were afterwards painted upon in oil by his much more famous son—

VANDERVELDE, WILLIAM, the Younger, who was born at Amsterdam, in 1633. He received his education in art from his father, whom he followed to England. The designs produced by the father, the son was employed to colour; and for this service, to him also a pension of £100 a year was assigned. This official and subsidiary employment was, however, the least important part of his activity, his time being mainly devoted to the series of original works which have given him assured rank as one of the greatest of marine painters. In his rendering of the ocean, in its various moods, V. has had few equals; and his works are now highly valued by the connoisseur. The best of them are to be found in England, the Gallery at Bridgewater House being particularly rich in fine specimens. V. lived for the most part with his father at Greenwich; and after his death, in London, where, in 1707, he died.

VAN DIE'MEN'S LAND. See TASMANIA.

VANDYCK. See DYCK.

VANE, SIR HENRY, a notable English politician of the 17th c., was born in 1612. His father, also a Sir Henry, was a distinguished statesman in the reigns of King James I. and Charles I., and received many proofs of the royal favour; but having taken part in the prosecution of Strafford (q. v.), he was deprived of all his offices of honour and emolument. When the parliament rose against the king, V. remained neutral; and some time before the execution of Charles, he withdrew to his seat at Raby Castle, where he died in 1654.—SIR HENRY VANE, the Younger, studied at Westminster and Magdalen Hall, Oxford, where he appears to have embraced, with all the inconsiderate enthusiasm of his character, those republican principles for which he afterwards became so famous. His travels in France and Switzerland strongly confirmed him in his aversion to the government and discipline of the Church of England, and in 1635, he sailed for New England—the refuge of disaffected spirits in

those days. He was soon after chosen by the people governor of Massachusetts; but his predilections in favor of 'Antinomian' opinions soon robbed him of his popularity, and in 1636, or thereabouts, he returned home. He now married a daughter of Sir Christopher Wray of Ashby, in Lincolnshire, and entered on a political career. Through his father's interest, he was appointed treasurer of the navy, along with Sir William Russell, and entered Parliament for Kingston-upon-Hull, in 1640, but almost immediately joined Pym and the anti-court party, of which he became one of the most vehement and resolute leaders. When the Civil War broke out, no man was more conspicuous in the military and theological politics of the time than Vane. He carried to the House of Peers the articles of impeachment against Archbishop Laud; he was a member of the Westminster Assembly; a 'great contriver and promoter of the Solemn League and Covenant' (though in his heart he abhorred both it and presbytery, and only used them as a means of crushing the bishops); the chief instrument in carrying the 'self-denying ordinance' (1644); and one of the commissioners at the treaties of Uxbridge (1644—1645) and the Isle of Wight (1648). But he did not view with satisfaction the increasing power of Cromwell and the army. He was too extravagant a parliamentarian, too much of a visionary and enthusiast, to be pleased with the supremacy of the musket and sabre, and for some time he withdrew altogether from public affairs. On the establishment of a Commonwealth, however, in February 1649, V. was appointed one of the Council of State; yet his antipathy to Cromwell, and his factious, pragmatical, hair-splitting activity so much increased, that the former, who looked upon V. as a subtle promoter of divisive courses, called him a 'juggling fellow;' and was probably in deep earnest, when, at the dissolution of the Commons, in April 1653, against which V. protested with a sort of feminine sharpness, he cried out: 'The Lord deliver me from Sir Harry Vane!' In 1656, V. wrote a book, entitled *A Healing Question Propounded and Resolved*, which was so hostile to Cromwell's protectorate, that it was found necessary to imprison the author in Carisbrooke Castle, Isle of Wight. He was released after a detention of four months; and attempts were made by Cromwell to win him over, but V. was inflexible in his fanaticism; and during the rule both of Cromwell and Richard, he maintained an attitude of sullen discontent. After meddling a little in the helpless intrigues that followed the abdication of Richard, he was ordered by parliament to withdraw to his house at Raby. When the Restoration took place, V. was one of the twenty persons excluded from the *Act of General Pardon and Oblivion;* and in July 1660, he was committed to the Tower. On the 2d of June 1662, he was arraigned, and indicted of high treason before the Middlesex grand jury, found guilty (on the 6th), and on the 14th was beheaded on Tower Hill. His son was knighted by King Charles, and raised to the peerage by King William, as Lord Barnard of Barnard Castle. V. was a subtle, restless, crotchety, unwise kind of man—a real thorn in the flesh of the great Cromwell. He was one of the Fifth Monarchy Sect, and much given to extravagant religious musings, and to praying (with his friends) in language wholly unintelligible. He also wrote several political and theological treatises, which do not require special mention.—See *The Life and Death of Sir Henry Vane, Knight* (London, 1662); Birch's *Lives;* and Ludlow's *Memoirs.*

VANGS, ropes on either side of a gaff, for steadying, or acting as braces to, a fore-and-aft sail.

VANI'LLA, a genus of parasitical *Orchideæ*, natives of tropical parts of America and of Asia; which spring at first from the ground, and climb with twining stems to the height of 20 or 30 feet on trees, sending into them fibrous roots produced from nodes, from which the leaves also grow. These roots, drawing sap from the trees, sustain the plant, even after the principal root has been destroyed. The stem is four-cornered and juicy; the leaves long and fleshy. The flowers are in spikes, and are very large, fleshy, and generally fragrant. The fruit is a pod-like, fleshy capsule, opening along the side. The *Vanilla* of commerce was formerly supposed to be the fruit of *V. aromatica*, a native of tropical America, but is now ascertained to be chiefly, if not

Vanilla aromatica.

wholly, the fruit of *V. planifolia*, a species indigenous to Mexico, Guiana, Brazil, Peru, &c., and cultivated also in some of the West India Islands, the Mauritius, and Ceylon. The fruit is cylindrical, about a span long, and less than half an inch thick. It is gathered before it is fully ripe, dried in the shade, and steeped in a fixed oil, generally that of the cashew nut. It contains within its tough pericarp a soft black pulp, in which many minute black seeds are embedded. V. appears in commerce in packets of 50—100 pods, wrapped up in cane-leaves and sheet-lead, or in small tin boxes. It has a strong, peculiar, agreeable odour; and a warm, sweetish taste. The interior pulp is the most aromatic part. Benzoic acid is sometimes so abundant in it as to effloresce in fine needles. V. is of little use in medicine, although it is a gentle stimulant and promotes digestion, and in large doses is said to be a powerful aphrodisiac; but it is much used by perfumers, and also for flavouring chocolate, pastry, sweetmeats, ices, and liqueurs. Balsam of Peru is sometimes used as a substitute for it, as it is expensive, and the whole quantity imported into Britain does not exceed four or five cwt. annually. It is in very general use in South America. Several kinds are distinguished in commerce. The best is that called *Leg* or *Lec*, which is almost of a black colour, and covered with crystals of benzoic acid. Another kind, less fragrant, drier, and of a darker colour, is known as *Simarona*. A still inferior kind, with much broader, brown capsules, is called *Pompona*, or *Bova*. When the fruit of V. is fully ripe, liquid (*Baume de Vanille*) exudes from it, which is unknown in Europe, but is valued in Peru. V. has ripened its fruit in British hot-houses, but the

flowers are apt to fall off without fruit being produced, unless care is taken to secure it by artificial impregnation. This is, in some measure, the case even in the East Indies, and in some parts of America itself; and it is supposed that the presence of some insect, delighting in the flowers of the V., makes it more productive in other parts of America, especially in Mexico.

VANLOO, JEAN BAPTISTE, a member of a family originally Flemish, in which a love of art seemed indigenous, was born at Aix in Provence in 1684. His grandfather and father were both painters of some talent, and under the instruction of the latter, whilst yet a mere boy, he is said to have attained considerable proficiency as an artist. Subsequently, he settled himself as such at Nice, and afterwards at Toulon, where he married the daughter of an advocate. On quitting Toulon, on the occasion of its being besieged by the Duke of Savoy in 1707, he returned to his native place, and abode some years there. He was again at Nice in 1712, and in the year following he visited Genoa and Turin. At the latter of these cities, he won the favourable regard of the Prince of Carignano, son-in-law of the Duke of Savoy, and was sent by him to study at Rome as a pupil of Benedetto Luti. After a further residence at Turin, he proceeded in 1719 to Paris, where apartments were assigned him in the hôtel of the prince his patron. Here he speedily acquired a great reputation as a portrait-painter. He was made a member of the Academy in 1731, and Professor of Painting in 1735. The loss of a large sum of money in the Mississippi Scheme induced him to come, in 1738, to London, where his portraits soon distanced all rivalry. His health, however, having given way, he retired in 1742 to his native district, Provence, where he died in April 1746.

Though chiefly eminent in portrait, V. had also considerable talent as a painter of historical subjects, and executed many works of this kind, in some of which a distinct merit is still recognised.

VANLOO, CHARLES ANDRÉ, younger brother of the preceding, was born in 1705, at Nice. As a boy, he was with his brother at Rome, and studied under Benedetto Luti. He accompanied his brother in 1719 to Paris, where, after some little interval in which he was employed as a decorative artist at the Opera-house, he betook himself to portrait-painting. He returned in 1727 to Rome, and there he executed some works which laid the basis of his future reputation, procured him, through the influence of the Cardinal de Polignac, a pension from the king of France, and in 1729, the title of Cavaliere from the pope. On leaving Rome, he visited Turin, painted there for the king of Sardinia a series of subjects from the *Jerusalem Delivered* of Tasso, and returned to Paris in 1734. The year following, he was made a member of the Academy, and his subsequent career was one of full prosperity. Tempting offers were made him by Frederick the Great, who desired to have him in his service; but he declined them in favour of a nephew, preferring to remain in Paris. In 1751, he was made by Louis XV. a knight of the order of St Michael; and in the course of the same year, he became Director of the Academy. In 1762, he was made chief painter to the king; and three years after he died. As the last really great specimens of the old French school of historical painting, his works have still their admirers.

VANNES, a seaport town of France, capital of the dep. of Morbihan, stands at the mouth of the Vannes, which falls into a narrow inlet of the Gulf of Morbihan, 310 miles west-south-west of Paris by railway. The town is surrounded by high walls flanked with towers. The cathedral is the most important edifice. Manufactures of linen and woollen cloth and ship-building to some extent are carried on, as well as commerce in honey, wax, wine, and hemp. Pop. 14,564.

VAN RENSSELAER, STEPHEN, known as 'the Patroon,' an American statesman, and patron of learning, was born in New York, Nov. 1, 1769, the fifth in descent from Kiliaen Van Rensselaer, the original patroon or proprietor of the Dutch colony of Rensselaerwick, who in 1630, and subsequently, purchased a tract of land near Albany, 48 miles long by 24 wide, extending over three counties. He was educated at Princeton and Harvard Colleges, and married a daughter of General Philip Schuyler, a distinguished officer of the Revolution. Engaging early in politics, at a period when they were the pursuit of men of the highest social position, he was, in 1789, elected to the state legislature; and in 1795, to the state senate, and became lieutenant-governor, president of a state convention, and canal commissioner. Turning his attention to military affairs, he was, at the beginning of the war of 1812, in command of the state militia, and led the assault of Queenstown; but the refusal of a portion of his troops, from constitutional scruples, to cross the Niagara river, enabled the British to repulse the attack, and the general resigned in disgust. As president of the board of canal commissioners for 15 years, he promoted the New York system of internal improvements; as chancellor of the state university, he presided over educational reforms; and as president of the agricultural board, aided to develop the resources of the state. At his own cost, he employed Professors Eaton and Hitchcock to make agricultural surveys, not only of his own vast estates, but of a large part of New York and New England, the results of which he published in 1824; he also paid Professor Eaton to give popular lectures on geology through the state. In 1824, he established at Troy an institution for the education of teachers, with free pupils from every county. Widening the sphere of his political interests, he went to Congress in 1823, and served several terms, exerting a powerful influence, and securing the election of John Quincy Adams as President of the United States. After an active, useful, and honourable career, worthy of his high position, he died at Albany, January 26, 1839.

VAN VEEN, OTHO (called also OTTOVENIUS), an eminent painter, was a native of Leyden, of which city his father was a wealthy burgomaster. The exact year of his birth is involved in some obscurity; but there seems tolerable evidence to fix it as about 1556—1557. He received a careful education, and in aid of the natural talent he displayed for drawing, the best masters were procured him. When about 15 years old, he was sent to Liége, whence, after a residence of three years, he proceeded to Rome, where he became a pupil of the celebrated Zucchero. In Italy, he remained about eight years; and on his return home by way of Vienna, the emperor, by tempting offers, vainly endeavoured to detain him in his service. It is significant of the estimation in which he had come to be held as an artist, that on his passing through Munich and Cologne, similar offers were pressed upon him. These also, however, he declined, wishing to settle in his native country. Finally, he went to reside at Brussels, as painter to the famous Alexander Farnese, Duke of Parma, and then governor of the Spanish Netherlands, of whom he executed a masterly portrait in armour, which greatly increased his reputation. The duke having died, he established himself at Antwerp, and opened an Academy, at which the great Rubens was one of his pupils.

in the matured art of Rubens, traces of his master are still, it is thought, to be detected; and in particular, he is held to have in all probability derived from him that fondness for allegorical and emblematic subjects which possessed him not always to his advantage. On the occasion of the entry into Antwerp of the new governor, the Archduke Albert of Austria, Van Veen was employed to design the arches and the other decorative business of the ceremonial, and so pleased was the duke with the taste and invention displayed, that he appointed him Master of the Mint at Brussels, to which city he returned to reside. An invitation to Paris was subsequently sent him by Louis XIII., but this he saw fit to decline; and in Brussels, at the age of 78, he died.

The chief works of Van Veen are religious pictures for churches. In the cathedrals of Leyden, Antwerp, and Bruges, good specimens may be found. On their own account, they deserve attention; but it is chiefly as 'the work of a man who had the honour to be the master of Rubens' (to quote the words of Reynolds), that they now for the most part receive it.

VA'POUR. As all *solids*, with the exception of carbon (an exception most probably due to our not being able to produce a sufficiently high temperature), are melted, or rendered *liquid* by the application of Heat (q. v.), so a further application of heat converts them into *vapour.* A vapour is really a gas, but it requires a little consideration to convince ourselves of the fact. Perhaps the best proof that can be given is that supplied by the beautiful experiments of Faraday (q. v.) and others on the liquefaction of gases. With a few notable exceptions, such as hydrogen, oxygen, and nitrogen, all gases have been liquefied by a proper application of pressure or cold, or of cold and pressure combined. The difference, in common language only, between a vapour and a gas is this: A gas is a substance which at ordinary temperatures and pressures exists in a state of vapour; while a vapour is produced by the application of heat to a substance which is ordinarily found in the solid or liquid form. In other words, gases are the vapours of substances which, in the liquid form, boil at very low temperatures.

The most familiar instance of vapour is aqueous vapour, or Steam (q. v.). At all temperatures, even as low as the freezing-point, ice and water give off vapour; and the quantity produced is determined by the temperature alone: that is, Evaporation (q. v.) at any temperature continues (more or less slowly according to the quantity of air or other gas which is present) until the pressure exerted by the vapour upon the containing vessel attains a certain definite value, depending on the temperature alone. If the temperature be such that the corresponding vapour-pressure is equal to the pressure of the air, vapour comes off freely, and we have the phenomenon called boiling.

Vapour in a vessel which contains some unevaporated water is thus always *saturated*, as it is called, i. e., the full amount of vapour capable of existing at the temperature of the vessel is present. If it be compressed, some is liquefied; if allowed to expand, more vapour is formed.

If, however, there be no water present in the liquid form, and the temperature be gradually raised the pressure of the vapour will rise, but much more slowly than when water is present, because no more vapour can be formed. In this state, that of *superheated* steam, vapour behaves almost exactly as an ordinary gas.

Chlorine, carbonic acid, sulphurous acid, &c., thus exist at ordinary temperatures as *superheated* vapours; and can therefore be reduced by cold and pressure to the condition of *saturated* vapour, when they are easily liquefied by carrying the process further.

There is little doubt that if sufficient cold and pressure could be applied as easily as they can be produced, even oxygen and nitrogen would be liquefied. With regard to hydrogen, we are not entitled to be quite so certain; as it may possibly require an amount of cold which we may never have the means of producing.

Aqueous vapour may be liquefied by cold alone, or by pressure alone, as we have seen; and at ordinary temperatures, it is easy to liquefy sulphurous acid, ammonia, and even carbonic acid and laughing gas, by mere compression. Gases absorbed by charcoal, or by spongy platinum, i. e., condensed by intense molecular forces on the large surface presented by the interstices in these bodies, must in all probability exist in the state of liquids. Carbonic acid is liquefied when exposed to a pressure of 35 atmospheres at ordinary temperatures; and some varieties of charcoal absorb from 80 to 100 times their bulk of this gas. Remembering that, on account of the impenetrability of matter, the gas can only be in the *pores* of the charcoal, and that their whole bulk forms but a small fraction of that of the charcoal itself, we see that in all probability the absorbed gas must be condensed so enormously as to have become liquid. It is probable that in Graham's recent process, for separating by dialysis (see OSMOSE) the oxygen and nitrogen of the atmosphere, the film of vulcanised india-rubber which is employed as septum compels these gases to pass through its pores in a liquid form.

Some extraordinary experiments, due to Cagniard de la Tour (the inventor of the SIRÈNE, q. v.), have given us valuable information on the subject of vapours. He shewed that when water, ether, and other liquids are hermetically sealed in glass tubes, so as to fill from a quarter to a half of the tube, the application of the requisite amount of heat is sufficient to convert the whole into vapour. This vapour, therefore, has a density equal to half or quarter of that of the liquid! Ordinary steam from boiling water has only about $\frac{1}{1700}$th of the density of water (in common language, a cubic inch of water gives a cubic foot of steam). These experiments are very dangerous.

The most recent experiments of this nature are due to Andrews. Having, by mere pressure, partially liquefied carbonic acid in a glass tube, he raised the temperature gradually, and observed that the demarcation between the liquid and the gas became less and less definite; the capillary curvature of the surface of the liquid also diminishing. At about 88° F., the liquid surface became horizontal, and the liquid disappeared. The tube then appeared to be filled with a homogeneous substance, neither gaseous nor liquid; apparently a new state of matter. When the temperature was slightly diminished, or the pressure relaxed, there was a singular appearance of flickering striæ, such as one sees on mixing alcohol and water, or on looking through the column of irregularly heated air rising from a hot body. No pressure that Andrews could apply, not even 400 atmospheres, could liquefy this gas when its temperature was above 88° F. It appears that hydrogen, even at the lowest temperature we can produce, is *above* the point at which no application of pressure can liquefy it.

VAR, a dep. in the extreme south-east of France bounded on the S. and S.-E. by the Mediterranean, and on the N.-E. by the recently erected dep. of Alpes Maritimes. See ALPES MARITIMES in

Supplement. Area, 2348; pop. (1872) 293,757. The dep. receives its name from the river Var, which formerly served as its boundary on the east, but which, since the arrondissement of Grasse was taken from the dep. of Var, and added to that of the Alpes Maritimes, now belongs entirely to the latter. Var is well watered by a great number of streams, of which the chief are the Gapau, Argens, and Bianson. In the north and north-east, it is mountainous, being traversed by a branch of the *Alpes de Provence*, called the Monts de l'Esterel. Between the mountains and the water-courses are many very fertile valleys. The climate of Var, tempered by the altitude of the surface, is pleasant. Fruits of all kinds are here cultivated with remarkable success; tobacco is grown, and 17,600,000 gallons of wine are produced annually. The dep. abounds in minerals; an active commerce is carried on, the exports being chiefly wine, fruits, olive oil, and other agricultural and horticultural products. It is divided into the three arrondissements of Draguignan, Brignoles, and Toulon. Capital, Draguignan.

VARA'NGIANS (Ger. *Warâger*, or *Wäringer*), a Norman people of the Baltic coast, who greatly damaged by their piracies the commerce of the republic of Novgorod, and subjugated repeatedly the Slavic and Finnish peoples of Northern and Central Russia. They forced the Krivitches, Tschudes, and other tribes to pay tribute, and wrested from the Russians the districts now known as Revel, Petersburg, and Archangel; the Russians retreating into Finland and Karelia. Gradually the two nations became intermixed, and towards the 9th c., the names Russian and Varangian appear to have been considered synonymous. In 862, the rulers of this Russo-Varangian nation, Rurik (q. v.), Sineous, and Truvor, were invited by the federative state of Novgorod, in which the Slaves were dominant, to put themselves at its head, and Rurik accepting the invitation, founded the Russian monarchy. See RUSSIA. The V. were at first distinguishable in various ways above the other peoples of the Novgorod state; but being far inferior in number, were soon forced to adopt the Slavic tongue, conform to Slavic manners, and so become merged in the predominant population. The great success which attended this experiment of the Novgorod confederacy, induced other Slavic states which were located on the Dnieper to put themselves under the protection of the warlike V.; and accordingly we find, soon after 862, a second Slavic state at Kiev, under the rule of Oskold, a Varangian chief, and the conqueror of the barbarous Chazars. After Rurik's death, his successor in power, the Regent Oleg, united Kiev to Novgorod, making Kiev the capital—a position it held till supplanted by Moscow (q. v.).

VARA'NIDÆ, a family of saurian reptiles, having a very elongated body, without a dorsal crest; strong legs, and long unequal toes; the tail long and slightly compressed; the scales tuberculous, and arranged in rings; the tongue protractile, dividing into two points as in serpents. Some of them are aquatic, and some inhabit dry and sandy places. The terrestrial species have the tail conical; the aquatic species have it compressed and often crested, so that it becomes a powerful organ of locomotion in water. The motion of the terrestrial species is aided by the tail, and is always serpentine. Some of the V. attain a large size. They feed on animal food of any kind, and have been seen to attack a young deer swimming across a river. The species are not numerous, and belong chiefly to the eastern hemisphere.

VARA'ZZÉ, a small town of Northern Italy, on the Gulf, and 18 miles south-west of the city of Genoa. Some trade in wood and extensive construction of fishing-boats are here carried on. Pop. 8262.

VA'REC, an old name for crude carbonate of sodium.

VARE'SÉ, a town of Northern Italy, in the province of Como, and 13 miles west of the town of that name. It is a handsome town; contains a number of fine palaces and magnificent villas; and carries on manufactures of silk, cotton, paper, and hats. Pop. 5030. V. is of very ancient origin. The Romans kept it strongly garrisoned as a stronghold against invasion from the north.

VARIA'TION, in Music, a transformation of a melody by melodic, harmonic, contrapuntal, and rhythmic changes. The subject chosen is called the theme; it is first simply harmonised with or without an introduction, and then repeated in a variety of different transformations, and the variations collectively with the theme constitute the piece. Occasionally, the different variations are combined by an intermediate passage; but generally each has its separate close, and the whole terminates with an extended and richly-developed variation or a coda.

VARIATION OF THE COMPASS. See TERRESTRIAL MAGNETISM.

VARICE'LLA (Lat., a little pimple), popularly known as CHICKEN-POX (q. v.).

VARICOCE'LE (known also as CIRCOCELE) is a term used in Surgery to designate a varicose state of the veins of the spermatic cord. It is caused by the same conditions which give rise to Varicose Veins (q. v.) elsewhere—viz., weakness of structure, combined with obstruction through corpulence, constipation, &c., to the return of the venous blood. For a description of its symptoms, and of the suitable treatment, we must refer to any ordinary textbook of Surgery.

VA'RICOSE VEINS. When a vein becomes dilated at a certain part of its course, for no apparent physiological object, such as relieving the venous circulation elsewhere (as, for example, in the case of the superficial abdominal veins enlarging in order to relieve a compressed vena cava), it is said to be varicose, the actual dilatation being called a *varix* (a word used in this sense by Cicero and Celsus). Some veins seem to be unaffected by varices, which, however, are of common occurrence in the sub-mucous veins of the rectum (constituting hæmorrhoids or piles), in the spermatic veins, giving rise to Varicocele (q. v.), and in the veins of the lower extremities. They are occasionally (but very rarely) found in other veins. Certain conditions of the system favour the formation of varices, amongst which may be noticed an indolent temperament, and a debilitated condition of the general system, accompanied by a relaxed state of the walls of the veins; and possibly also a congenital predisposition or hereditary tendency. Persons with such a predisposition are more likely to suffer from this affection if their occupation is one which involves much standing or walking; and cooks, washerwomen, and foot-soldiers have been selected as specially prone to varicose veins. Varices may occur at almost any period of life, but are chiefly developed during middle age. Their formation is aided by any condition of the system which impedes the circulation, as certain diseases of the heart, lungs, and liver; and by continued *high living*, which is especially liable to induce hæmorrhoids. From the researches of Andral, it appears that in varicose veins the coats of the dilated vessels may become

thickened or may become thin; that they may be lengthened so that the veins become tortuous; and that the dilatation may be unequal, giving rise to the formation of pouches; and that, in consequence of the enlarged caliber of the vessels, the veins only act imperfectly, and gradually undergo degeneration. Varices occurring in the leg, to which our remaining observations apply, commonly give rise to deep-seated aching pain in the limb, with a sense of weight, fulness, and numbness, before there is any external appearance of the affection. In a more advanced stage, the ankles swell in the evening, and the feet are always cold. After a time, a small tumour of a bluish tint appears, which disappears on pressure, but returns on the removal of the pressure, and is caused by a dilating vein. This dilatation extends, and forms knotty, irregular tumours, soft to the touch, diminishing on pressure, or on the patient's assuming a horizontal posture, and giving a bluish tint to the adjacent skin. These tumours commonly occur in the middle of the leg, along the track of the saphena veins, but they often extend along the whole of the leg and thigh. With regard to treatment, it may be mentioned that old varices cannot be cured, except by operations dangerous to life, although much may be done for their relief. In their earlier stages, they are, however, more amenable to treatment. As the disease is a very common one, we shall enter somewhat in detail into the palliative treatment which any one may adopt for himself. The venous circulation of the limb should be as much as possible facilitated by the disuse of garters; by keeping the limb (if the means and condition of the patient permit it) in a horizontal position for a month or six weeks; by prohibiting walking, and allowing only carriage-exercise, with the leg elevated to the horizontal position. The limb should also be carefully bandaged from the toes to above the knee, the bandage being replaced daily, and the limb then well rubbed with the hand, or with a flesh-brush, for ten minutes or more, from below upwards, so as to stimulate the circulation. When the circumstances of the patient hinder this treatment, elastic stockings may be tried during the day, or ordinary bandages, with a pad of lint placed on each varicose cluster before the bandage is applied. In cases where only one or two trunks are affected, the disease may be prevented from extending by the application of pieces of wash-leather spread with soap-plaster firmly over them. At the same time, the general health must be attended to. Ill-nourished, feeble patients must be treated by tonics and nourishing diet; while over-fed, plethoric patients require mild but often repeated purgatives to relieve the portal circulation. In the numerous cases in which there is a relaxed condition of the veins, the tincture of sesquichloride of iron may usually be given with advantage in half-drachm doses thrice daily in half a tumbler of water, with a colocynth pill every second night, to obviate the constipating action of the iron. Amongst the means of effecting a *radical cure*, by causing coagulation of the blood in the dilated veins, when they shrink and contract permanently, are (1) caustic potash applied over the course of the vessel, (2) subcutaneous incision of its walls, and (3) compression of the vessel between a steel pin and a twisted suture. We believe that the cases are rare in which the pain of the varix is so great as to disqualify a patient from his ordinary work, and these are the only ones in which any of these operations should be recommended; 'and the patient,' says Mr Callender, 'if wise, will be contented with the palliative measures of a more simple character.'—Holmes's *System of Surgery*, vol. iii. p. 321. Amongst the troublesome consequences of varicose veins are the obstinate ulcers, known as varicose ulcers, to which they give rise; and it must be borne in mind that occasionally, when the skin gets thinned by prolonged pressure, the varices burst through it, and give rise to hæmorrhage, which, if not promptly stopped, may cause fainting, and even death. When such an accident occurs, the patient should at once be placed in a horizontal position, and the leg raised, in which case the bleeding will probably cease. If it continue, a pad of lint must be pressed upon the mouth of the bleeding vessel by means of a few turns of a bandage round the limb.

VARI'ETY, in Natural History, a term employed to designate groups subordinate to Species (q. v.). Varieties are regarded as less permanent than species; and those who regard species as perfectly distinct in their origin, look upon varieties as modifications of them due to particular causes. Of course those who adopt Darwin's view of species do not deem the distinction between species and varieties so important, but rather consider varieties as species in process of formation. However this may be, all naturalists acknowledge a difficulty of deciding what are varieties and what are species; and some reckon as varieties what others regard as distinct species. The whole subject is involved in difficulty, and must be studied both with respect to general principles, and to the peculiarities of particular cases. Whatever theory may be adopted, many of the groups now distinguished by particular names are doubtful, and their designations must be regarded as merely provisional. It cannot be certainly said whether they are varieties or species. The term *Variation* has been employed by some authors to designate forms less permanent than varieties, but the term has not obtained general acceptance.

VARI'NAS, a town of Venezuela, on the San Domingo, 90 miles south-east of the nearest shore of Lake Maracaybo. It stands at the entrance to a valley covered with tobacco-plantations. V. carries on a trade in tropical productions and in cattle. Pop. stated at 12,000.

VARI'OLA. See SMALLPOX.

VA'RIX. See VARICOSE VEINS.

VA'RNA, an important fortified seaport of European Turkey, in Bulgaria, on the northern side of a semicircular bay, an inlet of the Black Sea, 180 miles north-north-west of Constantinople. It stands on a sandbank, and the city wall, the base of which in some places is 20 or 30 feet above sea-level, is in other places on a level with high-water. The defences towards the sea are mounted with heavy cannon. The town itself is crooked, irregular, dirty, and dilapidated, and as viewed from the sea, it presents a huge jumble of red-tiled houses, interspersed here and there with mosques and minarets. Pop. 26,000, among whom are many foreign traders. The allied French and British troops were here encamped for some time in 1854. The harbour of V. is exposed to the south and south-east winds, nevertheless a considerable trade is carried on, although there are no consular reports as to the extent and character of that trade.

VA'RNISH is a solution of some resinous material in any proper solvent, alcohol and oils being the ones chiefly employed. The solution must be of such consistency as to enable it to be very thinly and smoothly spread over the surface intended to be varnished, so that when it dries, it leaves a thin resinous coating, which is either naturally glossy, or can be made so by mechanical polishing. From the extremely inflammable nature of the material

employed, the preparation of varnish is extremely dangerous, and should not be attempted except in premises specially adapted for the purpose, and with skilled workmen. The resinous gums, such as copal, anime, and mastic, and the various kinds of lac, are those chiefly used; the copals and anime are employed in making the oil-varnishes, and the lacs and gum-mastic for spirit-varnishes. Heat is required with both kinds of solvents, and it is obtained by hot-water baths as a means of safety. Colouring matters are added to some varnishes, especially to those used on metal, as the lacquer varnish used to protect the polished surface of brass, which is coloured with gamboge and turmeric. Saffron, aloes, dragon's-blood, and asphalt are also used to give yellow, brown, red, and black colours.

VARNISH TREE, a name given to several trees of the family *Anacardiaceæ*, the resinous juice of which is used for varnishing or for lacquering. The BLACK V. T. (*Melanorrhœa usitata*) is described in the article MELANORRHŒA; the JAPAN V. T. (*Rhus vernicifera*) in the article SUMACH. Another tree, valuable for the varnish which it yields, is *Stagmaria verniciflua*, a native of Java, Sumatra, Borneo, Celebes, and other East India islands. The juice is extremely acrid, and soon hardens into a black resin. To obtain it, pieces of bamboo are inserted into the bark, and allowed to remain all night, as the juice flows more freely by night than by day. It sells at a high price. It is prepared for use by boiling it with equal parts of oil, obtained from the fruit of the *Mimusops elengi*. The exhalations of the tree are said to be very noxious.

VA'RRO, 'the most learned of the Romans,' so called from his vast erudition in almost every department of literature, was born 116 B.C., and educated first under L. Ælius Stilo Præconinus, and then under Antiochus, a philosopher of the Academy. V. served with distinction in the wars against the Mediterranean pirates and Mithridates; but afterwards as legatus of Pompey in Spain, he was compelled to surrender his forces to Cæsar. He continued to share the fortunes of the Pompeian party till its defeat at Pharsalia, after which he solicited and obtained his pardon from Cæsar, by whom he was employed to collect and arrange the great library designed for the public. The next period in V.'s life was spent in literary retirement, chiefly at his villas near Cumæ and Tusculum. When the 2d triumvirate was formed, his name was enrolled in the list of the proscribed; but he succeeded in escaping, and, after some time spent in concealment, he was received under the protection of Octavian. The residue of his long life was spent in the tranquil prosecution of his favourite studies, rendered all the more arduous by the destruction of his magnificent library. He died in his 89th year, 28 B.C. V. was not only the most learned, but also the most prolific of Roman authors. He himself confesses to having composed no fewer than 490 books; but only two of these have survived, and one of them in a fragmentary state. The most considerable of his writings, whether lost or extant, are as follows: 1. *De Re Rusticâ, Libri III.*, still extant, and though written in the author's 81st year, constituting the most important treatise on ancient agriculture known to us. 2. *De Linguâ Latinâ*, a grammatical work, which originally extended to 24 books, only six of which, however, have come down to us, and even these in an imperfect form. But for this treatise, mutilated as it is, we should be ignorant of many terms and forms, as well as of much recondite information regarding the civil and religious usages of the ancient Romans. 3 *Sententiæ*, consisting of 165 pregnant sayings strung together, not by V. himself, but probably by different hands at different times. 4. *Antiquitatum Libri*, comprising two sections, the *Antiquitates Rerum Humanarum*, in 25 books, and the *Antiquitates Rerum Divinarum*, in 16 books. This the greatest work of V., and on which his reputation for learning was mainly founded, has unfortunately perished, all but a few fragments. From the 2d section, St Augustine drew much of his well-known work, the *City of God*. 5. *Saturæ*, composed in various metres, and occasionally in prose. These pieces, copied to some extent from the productions of Menippus the Gadarene, were apparently a series of comments on a great variety of subjects, generally conveyed in the form of dialogue, and aiming at the enforcement of some moral lesson or serious truth in a familiar and even jocular style. Of these we have only fragments; and of the other works little more than the titles. The best edition of the *De Re Rusticâ* is that of Schneider (Leip. 1794—1797); of the *De Linguâ Latinâ*, that of Müller (Leip. 1833).

VARUN'A (from the Sanscrit *vr'i*, surround; hence, literally, 'the surrounder,' and kindred with the Greek *Ouranos*) is, in the Vedic Mythology of the ancient Hindus, one of the *Âdityas*, or offsprings of *Aditi*, the deity of space, and amongst these, one of the most prominent. He is often invoked together with *Mitra*, sometimes together with *Agni*, the god of fire, or with *Indra* (q. v.), or other elementary deities; but frequently he is also separately praised by the poets of the Vedic hymns. The character of V., as is the case with other Vedic deities, does not appear to have been or remained the same throughout the whole period represented by the Vedic poetry, but, on the contrary, to have varied according as new imaginations were connected with the idea out of which he arose. Originally, *Varun'a* seems to have been conceived as the sun from the time after its setting to that of its rise; while *Mitra* probably represented the sun at its rise. The night is therefore said to be V.'s, and the day Mitra's; and the 'ever-going Varun'a grants a cool place of rest to all moving creatures, on the closing of the eye (of *Savitr'i*, the sun).' As a consequence, the sun, as manifest during its daily course, is spoken of as his infant, and he 'prepares a path for the sun;' and the dawn, which is called the golden light of Mitra and V., 'goes before Varun'a.' Out of the mysteriousness with which night is easily endowed, and the qualities which imagination may ascribe to the luminous origin of V., then probably grew the moral attributes given to this deity; for he is extolled as the guardian of immortality; as the cherisher of truth; as armed with many nooses, with which he seizes evil-doers; as the forgiver of sins, and as having unlimited control over mankind. 'No one rules for the twinkling of an eye apart from him,' and he witnesses man's truth and falsehood. The functions of sovereign authority which are then also attributed to him are probably a consequence of his character as protector of the good, and punisher of the wicked; but his kingly might is, in some hymns, also associated with the power, predicated of him, of 'setting free the water of the clouds,' or of 'ruling over the waters that are in heaven and earth.' Whether the connection of V. with the element of water arose from the association of moisture with night, or, which is more likely, from the notion, that water (*vâri*, from the same radical, *vr'i*, as V.) envelops or surrounds the earth, as darkness does, may be doubtful; but it is worthy of notice that the passages of the R'igveda in which V. is spoken of as the cause of rain, or as the lord of rivers or the sea, are few, and perhaps do not belong to the earlier portion of R'igveda poetry. See, for more

detail, J. Muir's 'Contributions to a knowledge of the Vedic Theogony and Mythology,' in the *Journal of the Royal Asiatic Society* for 1864. Compare also the article VASISHT'HA.—It is in this latter character alone, however, that V. appears in the classical and Purânic mythology; for there he has ceased to impersonate the sun, when invisible, and though, at that period too, he is still mentioned as an Âditya, his real quality is that of the regent of the waters, and more especially of the ocean, personified. As such, he retains, it is true, the Vedic qualities as 'lord of punishment,' and carries the 'noose' to bind the wicked with; these attributes, however, are, then, not the reflex of his solar omniscience and power, but that of his might as the god of water.—Later fiction makes him also the regent of the west, probably in recollection of his Vedic character as the setting sun; and endows him with a wife, *Varun'âni*, a son, *Pushkara*, and sometimes also with a daughter, *Punjikasthalî*. It further gives him for a residence the fabulous mountain, *Pushpagiri*, 'the mountain of flowers,' and a marine monster, *Makara*, for his vehicle.

VARUS, PUBLIUS QUINTILIUS, a Roman of noble birth, was appointed governor of Syria, and on his return from that post, was sent by Augustus to command the armies of Germany. His instructions, also, were to introduce into that country the regular administration of a Roman province. The Germans were indignant at his proceedings, and under the leadership of a chief of the Cherusci, named Arminius (Latinised from Herman), attacked V., who, with three legions, the usual number of auxiliaries, and a strong body of cavalry, had proceeded as far as the Weser. By false intelligence, the proconsul was induced to quit his intrenched camp. The Romans marched in a long straggling line, encumbered with baggage, with their wives and children. Suddenly, they were assailed by the Germans in a forest, and it was with difficulty they forced their way to a clear space to encamp for the night. For the next two days, the Romans struggled on, marching and fighting, with decreasing forces, and exhausted strength, intending to reach, if possible, the fortress of Aliso on the Lippe. Near Kreutzberg, they were met by the main force of the Germans, and completely broken. V. killed himself in despair. Augustus, who was now old and weak, is said to have yielded to transports of grief, calling upon V. to give him back his legions. This victory of the Germans was gained 9 A.D., and rolled back the tide of Roman conquest. The Rhine, instead of the Weser, again became the boundary of the empire. The battle has ever since been a proud recollection for the Germans, and is known by the name of Herman-schlacht, that is, Herman's fight.

VA'RUS is a term employed in Surgery to designate a variety of Club-foot (q. v.). The corresponding Latin word signifies 'having the legs turned inwards, knock-kneed.' It may be regarded as the opposite to Valgus (q. v.), and as in the case of that word, *Talipes* must be understood. In the form of club-foot termed varus, (1) the heel is raised; (2) the inner edge of the foot is drawn upwards; and (3) the anterior part of the foot is twisted inwards, so that the patient walks on its outer edge.

VA'SARHELY, or HÓDME'ZÖ-VA'SARHELY, a town of Hungary, stands on a marshy plain, 5 miles from the left bank of the Theiss, and 16 miles north-east of Szegedin. It is considered the largest *market*-town of Hungary, and indeed of Austria. Pop. 42,500, actively engaged in cattle-breeding, and in the cultivation of wine and tobacco.

VASARHELY, or MAROS-VASARHELY, a handsome town of Transylvania, the largest of what are called the Szekler towns, and the centre of Szekler political life, stands on the Maros, on a fruitful plain 60 miles north-north-east of Hermanstadt. It has broad streets and well-built houses; excellent public schools, Protestant and Catholic—the latter richly endowed; a strong castle; and a choice public library, founded by Count Tekeli, and embracing 60,000 vols., among which are a MS. Tacitus, from the library of King Matthew Corvinus. Tobacco, wine, and fruit are largely cultivated. Pop. about 11,000.—*Transylvania*, by Charles Boner (Lond. 1865).

VASARI, GIORGIO, an Italian painter and author, was born at Arezzo, in Tuscany, in 1512. He was a pupil of Michael Angelo's, and obtained the patronage of many distinguished persons, as Cardinal Ippolito de' Medici, Clement VII., and the Dukes Alessandro and Cosmo de' Medici; but his pictures possess no peculiar or distinctive merit, and his reputation rests exclusively on his *Vite de' più excellenti Pittori, Scultori, e Architetti* (Lives of the most excellent Painters, Sculptors, and Architects; Flor. 2 vols. 1550; 2d ed. by V. himself, 3 vols. 1568). This work is written, on the whole, in a simple and honest style; at times, it is even marked by a noble eloquence. The criticism is often admirable; and in spite of frequent inaccuracies (which, indeed, have been corrected by Della Valle, Rumohr, Förster, and others), it remains a model of art criticism and biography. V. died at Florence in 1574.—Bohn has published an English translation of V., in 5 vols., forming part of the 'Standard Library' series.

VASCO DA GAMA. See GAMA.

VASCULARES, in De Candolle's botanical system, the first of the two great divisions of plants, consisting of those in which Vascular Tissue (q. v.) appears, and thus including all the phanerogamous plants, both endogenous and exogenous. See CELLULARES.

VA'SCULAR TISSUE, in Botany, that kind of vegetable tissue which is composed of closed tubes or vessels, elongated cells. The tubes have membranous walls of Cellulose (q. v.), and within them are juices of the plant, which often deposit secretions. They are generally almost cylindrical—although sometimes prismatical from compression—except that they taper to a point at each extremity, preserving their character as cells by being closed at the extremities. They lie close together in bundles, and often overlie one another at the ends. The principal kinds of vascular tissue are Woody Fibre (q. v.) and Laticiferous Tissue, composed of the vessels which convey the Latex (q. v.). Laticiferous tissue is generally composed of branched and anastomosing tubes, the walls of which are thin and delicate, extremely so in young plants. Many varieties of vascular tissue have, however, been distinguished by botanists, of which the most important are those classed under the name of *Fibro-vascular Tissue*, having spiral fibres in the tubes, winding up the inside of their walls as if to strengthen them. These fibres are elastic, and the coil can often be easily unrolled, at least whilst the tubes are young. Many fibres are often found in a single tube.

VASE (Lat. *vas*, Ger. *Fass*), a term applied, in its widest signification, to all vessels adapted either for ornament or for use. It is generally used in this sense with reference to ancient art; in connection with modern art, it is restricted to vessels of an ornamental kind. Few remains of antiquity have excited more interest than vases, particularly those of Greece, and of the Greek colonies and conquests. The names given by classical writers to vessels adapted for different purposes, have not always been

easily identified with the ancient vases which have been preserved to us; but according to the nomenclature of M. Gerhard, which has generally been adopted, the following are the principal varieties, classified according to their uses: 1. Vases for holding wine, oil, or water, known under the names of *amphora* and *diota stamnos*. 2. Vases for carrying water, *hydria*, *calpis*. 3. Vases for mixing wine and water, *crater*, *kelebe*, *oxybaphon*. 4. Vases for pouring, *oinochoë*, *olpe*, *prochoüs*. 5. Drinking cups or goblets, *cantharus*, *kyathus*, *karchesion*, *holchion*, *kyphos*, *kylix*, *lepaste*, *phiale*, *keras*, *rhyton*. 6. Vases for ointments or perfumes, *lekythos*, *alabastron*, *askos*, *bomylios*, *aryballos*, *kotyliscos*.

The materials of which vases are formed include metal, stone, glass, and earthenware.

Vases of the precious metals were in use among the ancient Egyptians. Among the Greeks and Greek colonists of Asia Minor, they were very early employed for sacrificial purposes, and those of silver were frequently chased, an art in which considerable progress had been attained at a remote period. The general improvement in design in the epoch of Phidias, told in the chaser's art, the complete development of which was, however, according to Pliny, due to Polycletus. In the later period of the Roman Republic, chased silver vases were more than ever in request; but under the Empire, chasing fell into disuse. Bronze, iron, and lead were all used as materials for vases. Bronze vases abounded among the presents made to the Greek temples; they were generally thin and hammered out, often decorated with inlaid ornaments or reliefs, among which mythological subjects and animal heads appear, and the handle sometimes assumed the shape of the human figure. Leaden vases were chiefly used for unguents or perfumes. The gold and silver vases of the first few centuries of the Christian era were, for the most part, imitation of pagan art. In the 12th c., a style was introduced, called *damascene* work, with patterns of gold or silver wire embedded in iron or bronze. Many vases of this kind were made by Benvenuto Cellini.

Among the mineral materials which, plain and enriched, have been used both in ancient and modern times for vases, are marble, lapis lazuli, jasper; semi-transparent stones, such as opal, girasol, agate, chalcedony, sardonyx, cornelian; as also transparent gems and rock crystal. Multitudes of vases of precious stones were brought to Rome from the conquered provinces, particularly from Asia. Those in highest esteem were the *myrrhine* vases, whose material has been the subject of dispute among antiquaries; they are described by Pliny as brilliant, gem-like, and of various colours, generally purple and white, mingled with the iridescent hues of the rainbow. Precious stones have not ceased to be a material for vases; large and costly vases of malachite and jasper are manufactured in Russia; and elaborately carved vases are still made of the white alabaster of Volterra, in Tuscany.

Glass has at all times been a favourite material for vases. Small toilet-phials of opaque glass were in use in Egypt as far back as 1450 B.C. The cameo vases of Rome, of which the Portland vase is the most celebrated example, were composed of two layers of glass, the outer of which, being opaque, was cut down into groups of figures, delicately executed in relief. About the 3d c., we have, for the first time, the *diatreta*, or bored vases, with an external veil of network, almost detached from the rest of the glass. In the 5th c., occur vases composed of two layers of glass, with gilded subjects—often figures of Christ and legends of saints—between them. Vases of green glass, or a later period, with undercut projections, bearing a rude resemblance to the diatreta, have been found in tombs in England and France. Venice afterwards acquired great celebrity for its glass vases. In the beginning of the 16th c., the Venetian glass-makers introduced a class of vases enriched with white or coloured filigree work, having the appearance of being incrusted in the glass. They were much sought after all over Europe; and great care was taken to prevent the secret of their manufacture from being discovered. Beautifully enamelled vases were also issued from the Venetian manufactories, as well as others of grotesque forms, representing imaginary animals, and pierced with holes or constructed in the form of a siphon, which are said to have been employed by alchemists, and in pharmacy and distillation. The German manufacturers, in the 16th c., produced vases with heraldic designs and inscriptions in enamel, generally cylindrical, and sometimes of considerable size, which are much prized by connoisseurs; in the following century, the designs became more artistic; and both in Germany and Italy, it was quite usual for distinguished artists to be employed to decorate these glass vases, in imitation of rock crystal, with ornaments, arabesques, and engraved subjects.

The most prevalent material for vases of all kinds, including those intended to hold the ashes of the dead, has generally been baked clay. Multitudes of Greek sepulchral vases have, after a lapse of more than fifteen centuries, been brought to light, at a time when learned men can appreciate them, and gather from them valuable information in history and archæology. An account of the terra-cotta vases of Greece, Italy, and other countries, is given under POTTERY.

VASISHT'HA (the superlative of the Sanscrit *vasumat*, wealthy) is the name of one of the most celebrated Vedic R'ishis (q. v.), the author of several hymns of the R'igveda, and a personage who seems to have played an important part in the early history of the Brâhmanic or priestly caste of the Hindus. In the account given of him, historical events and mythological fictions are so much blended together, that it is scarcely possible to gather more from it, for certain, than that he was a sage of high reputation, and a priest jealous of the privileges and the position of his caste, and ever ready to assert its superiority over the second or military and royal caste. In one of his R'igveda hymns, he claims to have been enlightened by the god Varun'a; and in another he is called the son of *Mitra* and *Varun'a* (q. v.), born from the mind of *Urvas'î* (q. v.). In other Vedic passages, his pre-eminence over other R'ishis, and his acquaintance with sacred and sacrificial knowledge, are extolled. In the Mahâbhârata (q. v.), which also calls him the son of Mitra and Varun'a—whence his appellation there, *Maitrâvarun'i*—he is mentioned as imparting divine knowledge to King Janaka, and as the family priest of the race of Ikshwâku; and in the Purân'as he is said to have been one of the arrangers of the Vedas in the Dwâpara age. In Manu and the Purân'as (q. v.), he becomes a patriarch, one of the nine mind-born sons of the god Brâhman; and according to some, marries Urjâ (Strength); according to others, *Arundhatî*, one of the Pleiades, by whom he has seven sons. Various other legends relating to him always endeavour to impress the Hindu mind with his Brâhmanic power over kings and Kshattriyas generally. Thus, so great was his power, as the Raghuvans'a relates, that when King Dilîpa was doomed to remain childless, because he had inadvertently offended the fabulous cow Surabhi, he was released of this curse by faithfully attending on the cow of V., which was the cow of plenty and an offspring of Surabhi. But

the most interesting episode of his life is that relating to his conflict with *Vis'wâmitra* (q. v.). A Vasisht'ha is also mentioned as the author of a law-book; but whether he is, or is intended to be, the same personage as the ancient sage, may be doubtful. The name is often written *Vas'isht'ha*, when it would be the superlative of *Vas'a*, meaning 'the most humble'—which the epic and Purânic V. certainly was not—or of *Vas'in*, meaning 'the sage who has thoroughly subdued his passions'—which, too, would seem to be a rather strange epithet of the irascible saint. But though the name of the owner of the cow of plenty, who could obtain anything he desired, is doubtless correctly spelled Vasisht'ha, the less correct spelling must nevertheless have been current for a considerable time, since so early a poet as Kâlidâsa (q. v.), in his Raghuvans'a, puns on the words *vas'î vas'isht'ha*, 'Vas'ishth'a, the sage with subdued passions.'—See, for the legends concerning V., J. Muir's *Original Sanscrit Texts*, vol. i. (1858).

VA'SSAL (Celtic, *gwâs*, a youth or page), in the Feudal System, is the correllative of Suzerain (q. v.). See also SUPERIOR, FEU.

VASSILKO'V, a town of Little Russia, in the government of Kiev, and 18 miles south-west of the city of that name. This town, which was founded in the 10th c., contains 10 factories, 5 of which are employed in the manufacture of tobacco. Pop. 15,832.

VA'STO, or IL VASTO, a town on the east coast of Southern Italy, in the province of Chieti, 26 miles south-east of Ortona. It stands on a rising ground facing the Adriatic, from which it is distant 1¼ mile, is enclosed by walls, contains a spacious square with a handsome fountain, a handsome palace, a castle, and several churches. It carries on an active trade in corn, oil, and vinegar. Pop. 9437.

VASUDEVA AND VASUDEVA. See under VISHN'U.

VATE'RIA. See TALLOW TREE.

VA'TICAN, PALACE OF, in Rome, the principal residence of the pope, and the seat of the great library and the museums, and collections of art, ancient and modern, which, for visitors, constitute one of the chief attractions of the city of Rome. The popes, very soon after the establishment of the peace of the church under the Emperor Constantine, had a residence at the V., which they occupied, although at uncertain intervals, conjointly with that of the Lateran. For a long time, however, through the medieval, and especially the late medieval period, the V. appears to have been neglected. It was Nicholas V. who began that systematic scheme for the improvement and embellishment of the V. which has resulted in what, taken altogether, may be regarded as perhaps the noblest of princely residences. Alexander VI., Julius II., and above all, Leo X., pursued the same plan; and there are very few of the succeeding popes who have not had a share in the enlargement or embellishment of the Vatican. Amid all the difficulties, financial and political, of his pontificate, Pius IX. has effected many tasteful works of completion or restoration, the most striking and effective of which is the great stair by which it is approached from the colonnade of St Peter's. The building, with its gardens and other appurtenances, is said to cover a space equal to the whole area of the city of Turin, such as it was twenty years ago, with a pop. of 130,000. It is popularly believed to contain 16,000 apartments of various sizes, but this is probably an exaggeration. Some of them, however, are of unrivalled beauty, among which may be particularised the chapel of San Lorenzo, the Pauline Chapel, and the still more celebrated Sixtine Chapel, which is decorated in frescoes from the pencil of Michael Angelo; the Sala Regia, the galleries and halls decorated by Raphael, Giulio Romano, and their scholars; the magnificent library, which, although surpassed in the number of volumes, is unrivalled among the cities of Europe in extent, in beauty of proportions, and in decorations; the galleries of antiquities, Christian and pagan, and of paintings, statuary, bronzes, medals, vases, and other objects of art. Many descriptions of the V., with costly illustrations, have been published, and are to be found in all great libraries. An extremely interesting account, historical and descriptive, is to be found in Donovan's *Rome, Ancient and Modern;* and the most recent additions will be found carefully detailed in Murray's *Handbook of Rome.*

VATTEL, EMERICH, a well-known writer on the law of nations, was born at Couret, in Neufchâtel, 25th August 1714. His father, a Protestant clergyman, had been ennobled by the king of Prussia, whose subject he was. V. studied for the church at Bâle and Geneva, but he devoted greater attention to the writings of Leibnitz and Wolf than to those of the Calvinistic divines; and instead of becoming a country clergyman, he resolved to push his fortune at the court of Berlin, as a man of letters and diplomatist. In 1741, he offered his services to Frederick II., who had just ascended the throne, but there was then no vacancy in the public service. Three years afterwards, he received an appointment at Dresden from the Elector of Saxony, then also king of Poland; and in 1746, he was sent by him as minister to Bern. In this post, he had ample leisure, and devoted himself to literary pursuits. He published, in French, under different titles, collections of essays on miscellaneous subjects, which are lively, and well written. But his chief attention for ten years was bestowed on his great work, the *Droit des Gens; ou Principes de la Loi Naturelle appliqués à la Conduite et aux Affaires des Nations et des Souverains.* This title sufficiently explains the scope of the work. It contained little that was new but it abridged and systematised the doctrines of Grotius, Puffendorf, and Wolf. V. had, however, that skill in arranging his materials, and that power of lucid expression, which so often characterise French men of letters; and his book became rapidly popular as a text-book of international law. Like all his predecessors in the same field, V. based his whole system on an imaginary law of nature, and it would be easy to enumerate a large number of false conclusions to which he came in the absence of the light thrown on the law of nations by practice, and by the principle of utility in our time, so generally adopted as the test of international morality. After the completion of his great work, V. was recalled to Dresden, where he married, in 1764, Marianne de Chêne, and was promoted to the rank of privy-councillor. The duties of his new post proved too arduous, and he died of over-work on 28th December 1767. Mr Chitty republished, in 1833, an English translation of Vattel, with notes.

VAUBAN, SEBASTIEN LE PRESTRE, Marshal of France, the celebrated military engineer, was born at Saint Leger de Fougeret, in the dep. of Nievre, 15th May 1633; and being left an almost destitute orphan at the age of ten, his education was carried on under the auspices of the *curé* of his village. Leaving Saint Leger in 1651, he set out on foot to join Condé's army, then on the Belgian frontier; and during two years of active field-service, obtained

large insight into the engineering methods then in practice. Taken prisoner in 1653, he joined the royalists, and during the succeeding contest was mostly attached to the army of Turenne, who intrusted him with the sole control of the besieging operations; and the powerful assistance which the extraordinarily rapid reduction of the enemy's strongholds gave to the king's little army, gained for V. the repute of being the most promising young engineer of the time. On the conclusion of peace in 1660, he was despatched to the west to demolish the rebel strongholds in Lorraine, and to take charge of Breisach; but in 1667, he appeared again in the north, capturing one after another the powerful defences of the Belgian frontier. About this period, the all-powerful Louvois, charmed by V.'s probity, punctuality, and habits of cool calculation, no less than by his genius, took him firmly by the hand; and it was as much owing to the great minister's favour as to the superiority of his designs that V. was preferred to the highly honourable and important office of fortifying the Flemish fortresses which had fallen into the possession of France. This labour accomplished in 1672, and the war with Holland resumed, V. took his old place as director of the siege operations, and for the first time introduced into practice in Western Europe the method of approach by parallels (recently borrowed from the Turks), at the siege of Maestricht (1673), and with such effect, that that strong fortress capitulated in thirteen days. After tracing the plan of siege for Treves, and with remarkable sagacity foretelling the date when it *must* fall, he set himself with energy to strengthen the newly-acquired fortresses in the Low Countries, and closed a long and brilliant array of services for 1674 by throwing himself into Oudenarde, where William of Orange besieged him in vain. In 1675, he inaugurated a new era in military tactics by obtaining the creation of a corps of engineers, though the completion of the innovation by the establishment of companies of sappers was denied him. In 1676, he conducted the remarkable sieges of Valenciennes and Cambrai, stormed the latter in open day, against the unanimous opinion of the generals of the army; and two years later was rewarded for his long and glorious services by the appointment of director-general of fortifications. This post gave him the supreme control of the department of military engineering, and the ten years of peace which followed 1678 supplied opportunity for V.'s rendering to France perhaps the greatest of his services, in surrounding the kingdom with a complete cordon of fortresses, fitted either for defence or for commanding weak points of the neighbouring countries. At intervals during this period, he captured the almost impregnable fortress of Luxembourg, and planned and partly executed the magnificent aqueduct of Maintenon, by which the waters of the Eure are conveyed to Versailles.

War breaking out again in 1688, V. conducted the sieges of Philipsburg, Mannheim, and Frankenthal (introducing, at the last, his invention of ricochet-firing), Mons (1691), and Namur (1692), with his usual success, though opposed at the last-named place by his great rival, Cohorn, who had fortified, and who defended it. After this period, V. almost disappears from the field of warfare, on which he had stood invincible for so many years, for the sieges of Charleroi (1693), Ath (1697), Breisach (1704), and the construction of the intrenched camp near Dunkirk (1706), are the only professional works of importance during the last 14 years of his life. After the peace of Ryswick in 1697, he had applied his active practical mind to the consideration of various deficiencies and anomalies in the internal government of France; and his zeal and research brought together a large mass of information and suggestion on numerous subjects, which was published under the curious title of *Oisivetés de M. de Vauban*, and contained recommendations for the collection of statistics of population, commerce, and agriculture, for supplying the army by recruitment, and valuable suggestions for improving the soil by drainage, &c. &c. Another of his works which excited an immense sensation at the time was the *Dîme Royale* (1707), in which he discussed the question of taxation, and anticipated in the most striking manner the doctrines which, a century later, overthrew the French monarchy: such principles promulgated by a man of V.'s sterling integrity and profound practical wisdom, could not be expected to be very palatable to the king and court, of whose conduct they furnished indirectly the severest censure; and we are not therefore surprised to learn from Saint-Simon 'that the Marshal de Vauban was very ill received when he presented himself,' and that, by an edict of February 14, 1707, his book was seized and confiscated. V. did not long survive his disgrace, dying at Paris, March 30, 1707. Fontenelle calculates that he had constructed 33 new fortresses, repaired 300 old ones, conducted 53 sieges, and had been present at 140 'actions of vigour;' and in his practice, the capture of a fortress was certainly a mere question of time and powder. His various professional works on the attack and defence of places, and on mines, have been collected under the title of *Œuvres Militaires* (Paris, 1796); and besides these, we have various other Memoirs on professional subjects from his pen. Historical notices and eulogies of V. are abundant in French literature. See *Nouvelle Biographie Générale.*

VAUCLUSE, a dep. in the south-east of France, bounded on the W. by the Rhone, and on the S. by the Durance, which separates it from the dep. of Bouches du Rhone. Area, 1369 sq. m.; pop. (1872) 263,451. The Rhone is the great river, and its affluents, with the exception of the Durance, are all small. The dep. is traversed in the east by spurs of the Alps. The plains are all in the west—the chief being those of Orange, Carpentras, and Cavaillon. In the east, the mountains are separated by narrow, torrent-ploughed valleys; and the summits, the chief of which is Mont Ventoux, 6778 feet high, are arid and bare. The climate is healthy and temperate, although subject to great variations—the winds from the north and north-east being sometimes very violent. The dep., though more agricultural than manufacturing, does not produce cereals in great quantity; but the peach, pear, prune, almond, and fig trees bear excellent fruits. Olive, mulberry, and orange trees are quite common. Wines and honey, both held in high esteem, are produced. There are four arrondissements—Avignon, Apt, Carpentras, and Orange. Avignon is capital.

VAUD (Ger. *Wadt*), a canton which forms the western corner of Switzerland between the Jura and the Bernese Alps. Area, 1226 sq. m.; pop. 238,730. It is a comparatively level district, traversed, however, by an elevated tract, known as Mount Jorat, from which plains slope on either side to the Lake of Geneva on the south, and the Lake of Neufchâtel on the north. On both sides, near the mountains, there are extensive pasture-lands, but the greater part of the country is highly cultivated. The orchards and vineyards are very extensive, the latter yielding white wines of excellent quality. There are no manufactures of any importance. It is now traversed by railways,

which connect it in two directions with France, and in three with the rest of Switzerland. It forms part of French Switzerland, the dialect spoken by the inhabitants being the Vaudois. The religion is Protestant. V. has formed, since 1830, a democratic republic, each citizen 23 years of age having a vote in electing the council of the canton, which meets twice a year for about a month. V., after the fall of the Roman Empire, formed part of the Burgundian kingdom. In the 13th c., it became a dependency of Savoy, to which it was annexed in 1359. In 1476, the House of Savoy took part with the Duke of Burgundy in his struggle with the Swiss; and on his defeat, a part of V. was annexed to the adjoining cantons. In 1536, the Bernese took possession of the whole of V., which they divided into fifteen parts, administered by *baillis*, appointed at Bern. The nobility became patricians of Bern, and in this way acquired great influence. Still, the local councils had the power of appointing magistrates and administrative officers, which, to some extent, tempered the aristocratic character of the government. The French invasion put an end to the rule of Bern, and V. became a separate canton. The government remained in the hands of the higher classes until June 1830, when a new constitution, granting a vote to every adult *bourgeois* of good character, was obtained from the council, under the threats of a riotous mob, who had assembled at Lausanne. The Vaudois are industrious and well educated; and from this part of Switzerland come a large number of the Swiss teachers and governesses who are met with in all parts of the world. Capital, Lausanne (q. v.).

VAUDEVILLE, originally a popular song with words relating to some story of the day; whence it has come to signify a play in which dialogue is interspersed with songs of this description, incidentally introduced but forming an important part of the drama. The German *Liedertafel* is a somewhat similar composition.—The name Vaudeville is a corruption of Vaux de Vire, the name of two picturesque valleys in the Bocage of Normandy. One Olivier Basselin, a fuller in Vire (q. v.), composed, about the middle of the 15th c., a number of humorous and more or less satirical drinking-songs, which were very popular, and spread over France, bearing the name of their native place (Les Vaux de Vire). As the origin of the term was soon lost sight of, it at last took its present form. In the 16th c., Vauquelin still names such pieces Les Vaux de Vire.

VAUDOIS. See WALDENSES.

VAULT, an arched roof, usually constructed of stone or brick-work. The simplest kind of vault is the plain wagon or tunnel vault, being a simple segmental or semicircular arch, thrown across a longitudinal apartment, and extending from one end to the other. Ordinary bridges shew an example of this style of vaulting. Such vaults were commonly used by the Romans, who also built vaults with *groins*—i. e., vaults intersecting one another. See GROINED VAULTING. The tunnel arch, of a pointed form, was of very ancient introduction, having been used by the Assyrians for vaulting their large drains.

The Egyptians are also said to have been acquainted with vaulting; but the earliest remains of ancient vaults of any magnitude are Roman works.

The Roman vaults, where groined, are usually constructed with carefully cut stone, so as to prevent the angle from chipping. The medieval architects had not the costly materials or skill of the Romans at command, so they formed the groins only of dressed stone, and the filling in of the vault with commoner materials. This led to the groin becoming a prominent feature in medieval architecture, being generally ornamented with mouldings and carved work. We have already traced the progress of Gothic vaulting under the heads GOTHIC ARCHITECTURE, FAN-TRACERY VAULTING, RIB, &c. Domical or hemispherical vaulting was also much used by the Romans. The Pantheon, in Rome, is the finest example remaining, being a circular building with a dome 142 feet in diameter. Roman domes and vaults are frequently ornamented with sunk panels. During the Renaissance period, vaulting in great measure gave place to wooden roofs; but when employed, the domical or plain groined vaults of Roman architecture are chiefly used. In modern works, vaults and arches are gradually becoming superseded by the use of iron construction, both for roofs and for supporting floors, bridges, &c.

VAU'LTING-SHAFT, a small column, or pillar, supporting the ribs of a Gothic vault. These shafts generally occur in clusters, and may either spring from the ground, or be supported on small corbels in the wall.

VAUMURE, in old fortresses, a low work under the wall, in the nature of a *fausse-braye*.

VAUQUELIN, JEAN, a French poet, was born in 1535, of a noble family, at the château of La Fresnaye, near Falaise. He made a pretence of studying law at Poitiers, Paris, and at Bourges, but really spent his time in gaiety and verse-making. He finally became president of the *Présideal* bench at Caen, where he died in 1607. His *Œuvres Poëtiques* contain many sportive songs and other light pieces, which are yet read with pleasure. He was the first writer of idyls in French verse, and is considered as the real founder of French satire, which he redeemed from the grossness that had hitherto characterised the productions that went under that name.

VAUXHA'LL, a famous public garden in London, constituted as such immediately after the Restoration (May 1660), and supporting that character for nearly two centuries. It was situated in Lambeth, opposite Millbank, and near the manor called Fulke's Hall (the residence of Fulke de Breauté, a follower of King John), from which is derived the name Vauxhall. Pepys, writing May 28, 1667, describes the garden, and concludes that the entertainments there to be had are 'mighty devertising.' But the pastimes of V. were not always of a merely 'devertising' description. The eating, drinking, dancing, and flirtation that continually went on there, led to much quarrelling and dissipation. On the whole, V. does not appear to have been particularly strict in its morals. The loose character of the amusements it afforded is freely sketched by the dramatists and novelists of the last century, and is again revived in Thackeray's *Vanity Fair*.

VAUXHALL NECTAR, a mixture of rum and syrup, with an addition of benzoic acid, or flowers of Benjamin, in the proportion of half a dram to the quart. It was formerly in much repute as a drink, and was taken mixed with water. It was also called British arrack.

VA'VASOUR, or **VALVASSOR** (derived, like *vassal*, from Celtic *gwâs*, a youth or page), a term of feudal times, more in use in the continent of Europe than in England, employed somewhat loosely, and defined by Camden as the rank next below a baron. Its usual meaning was one who held his lands, not directly of the crown, but of

one of the higher nobility. In this class were comprehended the *châtelains*, who owned castles, or fortified houses, and possessed rights of territorial justice.

VAYGA'CH (also written *Vaigatch*, *Vaigatz*, and *Waigatz*), an island of the Arctic Ocean, belonging to Russia, stands between the mainland and the island of Nova Zembla, from the former of which it is separated by a strait about 5 miles broad. There is no resident population; but, being productive in furs and in fish, it annually attracts a number of Russian and Samoied hunters.

VÂYU (from the Sanscrit *vâ*, blow), the wind, is, in the Vedic Mythology of the Hindus, a deity, which originally seems to have held an equal rank with Indra (q. v.), but much more rarely occupies the imagination of the poets than this god, or Agni, or the sun; for though, according to Yâska (q. v.), ancient commentators of the Vedas hold that there are only three great deities—viz., *Agni*, fire, whose place is on earth; *Sûrya*, the sun, whose place is in heaven; and *Vâyu*, or *Indra* (q. v.), whose place is in the intermediate sphere—only a few hymns, comparatively speaking, are dedicated to Vâyu, whereas the other deities named are the subject of manifold praise. The description given by the R'igveda of the greatness of Vâyu nevertheless answers the position which those ancient commentators assign to him.—See J. Muir's 'Contributions to a Knowledge of the Vedic Theogony and Mythology,' in the *Journal of the Royal Asiatic Society* for 1864. In the epic and Purânic mythology, V. occupies but an inferior position, and the legends there related of him have no cosmical character. They give him a wife, *Anjanâ*, by whom he has a son, the monkey *Hanumat* (q. v.). When represented, V. either rides on an antelope with a sabre in his hand, or he is seated holding his son Hanumat in his arms.

VÂYU-PURÂN'A. See PURÂN'A.

VEDA (from the Sanscrit *vid*, know; kindred with the Latin *vid-*, Greek *id-*, Gothic *vait-*, Lithuanian *weizd-*; hence, literally, knowledge) is the technical name of those ancient Sanscrit works on which the first period of the religious belief of the Hindus is based. See INDIA, sec. *Religion*. The oldest of these works—and in all probability the oldest literary document still existing—is the *R'igveda*; next to it stand the *Yajurveda* and *Sâmaveda*; and the latest is the *Atharvaveda*. The first three also bear the collective title of *trayî*, or 'the threefold' (scil. science); and all four are considered to be of divinely inspired origin. Each of these Vedas consists of two distinct divisions—a *Sanhitâ*, or collection of *mantras*, or hymns; and a portion called *Brâhman'a*. A *mantra* (from *man*, think; hence, literally, the means by which thinking or meditation is effected) is, as Colebrooke, in conformity with the Mîmânsâ writers, defines the word, a prayer, or else a thanksgiving, praise, or adoration addressed to a deity: it declares the purpose of a pious act, or lauds or invokes the object; it asks a question, or returns an answer; either directs, inquires, or deliberates, blesses or imprecates, exults or laments, counts or narrates, &c. Sometimes it is addressed to the deity with a verb in the first person; sometimes it ends with the verb 'thou art,' or with the word 'thee.' See Colebrooke, *Miscellaneous Essays*, i. p. 308; Müller, *Ancient Sanscrit Literature*, p. 343; Jaiminîyanyâyamâlâvistara, as quoted in Goldstücker's *Pân'ini*, p. 69. If such a *mantra* is metrical, and intended for loud recitation, it is called *R'ich* (from *r'ich*, praise)—whence the name *R'igveda*, i. e., the Veda containing such praises—if it is in prose, and then it must be muttered inaudibly, it is called *Yajus* (from *yaj*, sacrifice; hence, literally, the means by which sacrificing is effected); therefore, *Yajurveda* signifies the Veda containing such *yajus*. And if it is metrical, and intended for chanting, it is termed *Sâman*; whence *Sâmaveda* means the Veda containing such sâmans (The original meaning of the latter word is obscure. Native grammarians derive it, but without much probability, from *so*, to give pain, because, they say, 'it is difficult to utter such mantras.' A mystical but grammatically impossible, account of *sâman* is given in the *S'atapatha-brâhman'a* and *Br'ihadâran'yaka*, where the word is analysed into *sâ* and *ama*, the former being interpreted as implying 'speech,' and the latter 'breathing forth,' since the chanting of the sâman, as the commentator says, is essentially the result of both.)—No special name is given to the mantras of the fourth Veda. The author of the mantra, or, as the Hindus would say, the inspired 'seer,' who received it from the deity, is termed its *R'ishi* (q. v.); and the object in which the mantra is concerned is its *devatâ*—a word which generally signifies 'deity,' but the meaning of which, in its reference to the mantras, must not always be taken literally, as there are hymns, in which not gods or deified beings, but, for instance, a sacrificial post, a remedy against bad dreams, the generosity of princes from whom gifts were received by the authors, or a chariot, a drum, weapons, the charioteer and horses employed in war, and other worldly objects, invoked, are considered as the *devatâ*.—See Colebrooke's *Misc. Essays*, i. p. 22; Wilson's *Rigveda*, vol. i., in the edition of F. E. Hall, p. 347.—*Brâhman'a*—derived from *brahman*, neuter, probably in the sense of prayer or hymn (see concerning this word, J. Muir, 'On the Relation of the Priests to the other Classes of Indian Society in the Vedic Age,' in the *Journal of the Royal Asiatic Society* for 1864; and the introduction of M. Haug's edition of the Aitareya Brâhman'a, vol. i. p. 4)—designates, according to *Mâdhava-Sâyan'a*, the great commentator on the Vedas, that portion in prose of the Vedas which contains either commandments or explanations; or, in other words, which gives injunctions for the performance of sacrificial acts, explains their origin, and the occasions on which the mantras had to be used, by adding sometimes illustrations and legends, and sometimes also mystical and philosophical speculations. The *Brâhman'a* portion of the Vedas is therefore the basis on which the Vedic ritual rests (see KALPA and VEDÂNGA), and whence the *Upanishads* (q. v.) and the philosophical doctrines (see SANSCRIT LITERATURE) took their development.

Though *Mantras* and *Brâhman'as*—both of which are also termed *S'ruti* (q. v.)—were held at a later period of Hinduism to have existed simultaneously, that is, from eternity, it is certain that the Brâhman'a portion of each Veda is posterior to at least some part of its Sanhitâ, for it refers to it; and it scarcely requires a remark that so great a bulk of works as that represented by both portions must have been the gradual result of a considerable period of time. There is, indeed, sufficient evidence to prove that various conditions of society, various phases of religious belief, and even different periods of language, are reflected by them. The difficulty, however, critically to discern these periods, is enhanced by the losses, probably considerable, which these writings suffered before they were preserved in the shape in which we now possess them. For in tradition, which records that *Vyâsa* (q. v.), after having compiled and arranged the Vedas, handed each of them to four disciples, and that these disciples taught them to their disciples, and so forth, down

to distant ages, there is so much indubitable, that Mantras and Brâhman'as had to pass through a large number of S'âkhâs, or schools, and that the discrepancies which gradually arose between these schools, both as regards the Vedic texts and the interpretation of these texts, cannot have been slight; for, apart from the conclusion yielded by a comparison of the remaining texts of some of these schools, later writers afford us an insight into the animosity which existed between these schools, and must have arisen from very material grounds. Thus, in a commentary on *Pâraskara's Gr'ihya Sûtras*, it is said: 'Vasisht'ha declares that it is wrong to follow the rules of another S'âkhâ. He says: "A wise person will certainly not perform the duties prescribed by another S'âkhâ; he that does is called a traitor to his S'âkhâ. Whosoever leaves the law of his S'âkhâ, and adopts that of another, he sinks into blind darkness, having degraded a sacred R'ishi." And in another law-book it is said: "If a man gives up his own customs, and performs others, whether out of ignorance or covetousness, he will fall, and be destroyed." And again in the *Paris'isht'a* of the *Chhandogas:* "A fool who ceases to follow his own S'âkhâ, wishing to adopt another one, his work will be in vain."'—See Müller's *Ancient Sanscrit Literature*, p. 51. That each *S'âkhâ* claimed the possession of the only true and genuine Veda, may be already inferred from passages like these. The differences between these S'âkhâs, however, did not consist—as has been believed—in their various readings of the S'ruti alone; it also consisted in considerable variations of their arrangement of the scriptures; in their additions or omissions of texts—as may be seen from still existing S'âkhâs of the Yajurveda—and, as is stated by *Madhusûdana*, and results from a commentator on Pân'ini, in their *different interpretation of the Vedic texts.* How great the number of these S'âkhâs was, may be inferred from the statement of the *Charan'avyûha*, a treatise ascribed to an ancient writer, S'aunaka; for it enumerates five S'âkhâs of the R'igveda; says that there were 86, and names 42 (or in one recension 44) of the Yajurveda; mentions twelve of the Sâmaveda, out of a thousand, which, it says, were at one time in existence, and nine of the Atharvaveda. The *Atharvan'arahasya*, a modern treatise on the Atharvaveda, while ascribing the same number of S'âkhâs to the Sâmaveda and Atharvaveda, speaks of twenty-one of the R'igveda, and a hundred of the Yajurveda. Of all these schools, however, the *R'igveda* is now extant only in one; the *Yajurveda* (both divisions, to be named hereafter, taken collectively) in three, and partially, in four; the *Sâmaveda* in perhaps two; and the *Atharvaveda* in one.

The character of the Sanhitâ or Mantra portion of the four Vedas—on which their Brâhman'a portion is based—as well as the relation in which these Sanhitâs stand to each other, is intelligible only if it is borne in mind that the ancient Hindu believed to secure the favours of his gods chiefly by the performance of sacrificial rites; that gradually these rites became complicated and manifold, and that special care, therefore, had to be taken to provide for a correct celebration of the sacrifices which had sprung up, and also to guard against the evil consequences which might result from inadvertence, or other causes beyond the sacrificer's control. The original worship seems to have been simple enough (see INDIA, sec. *Religion*)—it probably neither occupied much time, nor required the assistance of a priest. But when sacrifices were instituted which lasted from one day to eleven, nay, to a hundred days—and some works speak of sacrifices which went on for the space of one and even several years —and when the Brahmanic caste found the performance of such sacrifices to be an excellent means of establishing its sway over the other castes, and a convenient source of an easy livelihood, it was laid down as a rule that no sacrifice could be performed without one *R'itwij*, or priest; and that a great sacrifice, such as the Jyotisht'oma, Râjasûya, or other sacrifices which could only be celebrated by wealthy people or kings, required the assistance of not less than sixteen priests, besides a number of menials, who had to slay the sacrificial animals, to chant, or to perform other inferior work. These sixteen priests were then divided into four sections, each headed by one R'itwij, and containing besides him, his three purushas, or assistants. The first section consisted of the *Adhwaryu*, with his three purushas, the Pratiprasthâtr'i, Nesht'r'i, and Unnetr'i; the second, of the *Brahman*, with the three purushas, Brâhmanâchchhansin, Agnidh (or Agnidhra), and Potr'i; the third, of the *Udgâtr'i*, with the Prastotr'i, Pratihartr'i, and Subrahman'ya; and the fourth of the *Hotr'i*, whose assistants were the Maitrâvarun'a, Achchhâvâka, and Grâvastut. (In other accounts, the order of these sections varies, and in the section headed by the Brahman, the Potr'i precedes the Agnidh; see also Müller, *Ancient Sanscrit Lit.*, pp. 468, 469; where, however, by mistake, some of the assistant priests occur in the wrong sections.) The principal duties of these priests were further regulated in the following manner. The *Hotr'i* had to perform the rites relating to the R'igveda, the *Adhwaryu* those based on the Yajurveda; the *Udgâtr'i* was concerned in the rites of the Sâmaveda; and the Brahman had to possess a knowledge of all these three Vedas, and to set right any mistake that might have occurred in the performance of the ritual acts, or remedy any defect which might vitiate the efficiency of the sacrifice. He was therefore the most learned of all the priests; and the R'igveda itself, though perhaps in one of its latest portions, recognises this superiority of the priest Brahman. In the ritual works relating to the first three Vedas, no functions based on the use of the latest or the Atharvaveda are assigned to him, but in the *S'aunaka-Brâhman'a* of the *Atharvaveda*, where Prajâpati is introduced as intending to perform a Soma sacrifice, and asking the Vedas whom he should choose for his Hotr'i, Adhwaryu, Udgâtr'i, and Brahman, the Vedas answer him: 'Choose for a Hotr'i (the priest) who knows the R'igveda; for an Adwaryu, (the priest) who knows the Yajurveda; for an Udgâtr'i, (the priest) who knows the Sâmaveda; and for a Brahman (the priest) who knows the Atharvaveda;' and to explain the reason for such advice, they add that the R'igveda hymns having the earth for their abode, one who chooses a *Hotr'i* will obtain dominion over the earth; the Yajurveda mantras resting on the intermediate space, one who engages an *Adhwaryu* will obtain the world of that space; the Sâmaveda hymns dwelling on heaven, one who employs an *Udgâtr'i* will obtain that world; but one who chooses a *Brahman* will encompass the world of (the neuter) Brahman, or the supreme spirit, since the hymns of the Atharvaveda have for their abode Brahman.

The most interesting feature of this and similar passages is the tendency of their authors to maintain the greater efficiency of one of the later Vedas in comparison to that of the R'igveda, and consequently the greater practical superiority of these Vedas over the avowedly oldest Veda. And this is intelligible enough, if we compare the contents of these Vedas.

The worship alluded to in many hymns of the R'igveda must have consisted more of isolated sacrificial offerings than of a series of acts strung

together so as to form an elaborate sacrifice. There are other hymns, it is true, which betray the existence, at their time, of a ritual, already become complicated, as when three or four, or even seven priests are mentioned by the poet; but though these hymns, as well as the former, bear testimony to the existence, at that early period, of ritual acts, it does not follow that the R'igveda, as such, was composed for the purpose of being recited when they were performed. From the nature of its hymns, it results, on the contrary, that, having been composed, they were at some subsequent period connected with those pious acts which became more and more complicated, and gradually were systematised. But then even there remain verses which would not easily bend to such artificial purposes; and whole hymns, too, which would resist an attempt to force them into a liturgic code for which they were not intended by the poet's mind. A collection of songs, in short, which was the natural growth of time, and, to some extent, at least, the ingenuous outburst of the poet's feelings, became inadequate for a regular liturgy of a highly-developed and throughout artificial ritual. Out of this necessity there arose the *Sâma-* and the *Yajur-veda*. The former was entirely made up of extracts from the R'igveda, put together so as to suit the ritual of the so-called Soma sacrifices. For, as all native authorities agree in stating that the Sâma-veda contains none but R'igveda verses, the absence of 71 verses in the recension of this Veda, edited by Professor Benfey, from the recension in which the R'igveda now exists, does not disprove their unanimous statement: it must be accounted for by the circumstance, that these verses belonged to one or the other of the recensions of the R'igveda, which, as mentioned before, are no longer preserved. The origin of the Yajurveda is similar to that of the Sâmaveda; it, too, is chiefly composed of verses taken from the R'igveda; but as the sphere of the ritual for which the compilation of this Veda became necessary is wider than that of the Sâmaveda, and as the poetry of the R'igveda no longer sufficed for certain sacrifices with which this ritual had been enlarged, new mantras were added to it—the so-called Yajus, in prose, which thus became a distinctive feature of this Veda; and it is on the Yajurveda, therefore, that the orthodox Hindu looked with especial predilection, for it could better satisfy his sacrificial wants than the Sâma-, and still more, of course, than the R'igveda. 'The Yajurveda,' says *Sâyan'a*, in his introduction to the Taittirîya Sanhitâ, 'is like a wall, the two other Vedas like paintings (on it).' The sacredness of the Sâma- and Yajurveda, and the belief in their inspired character, rest on the assumption that they are of the same origin as the R'igveda, which dates from eternity, and which was 'seen' by the R'ishis who uttered it. That, in the case of the Yajurveda, this theory is only partially correct, results already from the description just given of it; for whatever losses the present text of the R'igveda may have suffered, it is admitted by all authorities that its mantras were always metrical, and that it can never, therefore, have possessed passages in prose. But how frail this theory is, and in what sense it is possible to speak of the sameness of origin even in the case of those hymns of the Sâma- and Yajurveda which are composed of R'igveda verses, a comparison of the place occupied by the verses of a few hymns taken from one and the other of these Vedas with the place which the same verses occupy in the R'igveda, will sufficiently shew.

The first hymn of the Sâmaveda consists of ten verses, nine of which are contained in the present recension of the R'igveda. If by the side of each of these verses the place is marked which it holds in the R'igveda, the result is this:

	Book.	Hymn.	Verse.
Sâmaveda 1, verse 1, is R'igveda,	6	16	10
" " 2, "	6	16	1
" " 3, "	1	12	1
" " 4, "	6	16	34
" " 5, "	8	73	1
" " 6, "	8	60	1
" " 7, "	6	16	16
" " 8, "	8	11	7
" " 9, "	6	16	13

The verses of which the hymn of the Sâmaveda 1, verses 370—380, is composed, correspond with the following verses of the R'igveda:

	Book.	Hymn.	Verse.
Sâmaveda 1, v. 370, with R'igveda,	8	86	10
" " 371, "	10	147	1
" " 372, "		absent	
" " 373, "	1	57	4
" " 374, "	3	51	1
" " 375, "	10	43	1
" " 376, "	1	51	1
" " 377, "	1	52	1
" " 378, "	6	70	1
" " 379, "	10	134	1
" " 380, "	1	101	1

If from the White Yajurveda the mantras, for instance, of the 22d to the 25th chapter were submitted to a similar test, it would be seen that in chapter 22, which has 34 divisions, only four verses occur in the R'igveda, viz.:

	Book.	Hymn.	Verse.
White Yajurveda 22, v. 10, in R'igv.	1	22	5
" " 15, "	5	14	1
" " 16, "	3	11	2
" " 18, "	9	110	3

that in chapter 23, with 65 divisions, there correspond:

	Book.	Hymn.	Verse.
White Yajurv. 23, v. 3, with R'igv.	10	121	3
" " 5, "	1	6	1
" " 6, "	1	6	2
" " 16, "	1	162	21
" " 32, "	4	39	6

that chapter 24 being in prose, cannot occur in the R'igveda; and that of chapter 25, with 47 divisions:

	Book.	Hymn.	Verse
White Yajurv. 25, v. 12, is R'igv.	10	121	4
" " 13, "	10	121	2
" " 14–23, are "	1	89	1–10
" " 24–45, "	1	162	1–22
" " 46, is "	10	157	1, 3, 2

(See the article 'The Inspired Writings of Hinduism,' in the *Westminster Review* for January 1864.)

All, therefore, that is left of the oldest Veda in the Sâmaveda and Yajurveda, is a R'igveda piecemeal; its hymns scattered about; verses of the same hymn transposed; verses from different hymns combined, and even the compositions of different poets brought into one and the same hymn, as if they belonged to the same authorship. That, under such treatment, the Yajurveda should have lost all poetical worth, is but what may be expected; it must be, however, matter of surprise that the Sâmaveda should have saved so much, as it even now possesses, of that genuine beauty which distinguishes the R'igveda poetry. The *Atharvaveda*, too, is made up in a similar manner as the Yajurveda, with this difference only, that the additions in it to the garbled extracts from the R'igveda are more considerable than those in the Yajurveda.

It is avowedly the latest Veda, and even its name, 'Atharvaveda,' as it was current already during the classical period of Sanscrit literature, does not yet occur in the oldest Upanishads (q. v.), where only the songs or revelations of the *Atharva-Angiras*, or of the *Bhr'igu-Angiras*, apparently denoting this Veda, are spoken of. The Atharvaveda was not used, as Madhusûdana, in his treatise on Sanscrit Literature says, 'for the sacrifice, but merely for appeasing evil influences, for insuring the success of sacrificial acts, for incantations, &c ;' but on this very ground, and perhaps on account of the mysteriousness which pervades its songs, it obtained, amongst certain schools, a degree of sanctity which even surpassed that of the older Vedas.

This being the general character of these four Vedas, a few remarks must here suffice to convey some idea of their special contents.

On the religious ideas expressed in the *R'igveda*, a general account is given in the article INDIA, sec. *Religion;* see also, besides the deities mentioned there, and the articles referring to them, VARUN'A, VÂYU, and YAMA, and J. Muir's 'Contributions to a Knowledge of Vedic Theogony and Mythology,' in the *Journal of the Royal Asiatic Society* for 1864. The social condition of the Hindus, as reflected from the hymns of this Veda, is not that of a pastoral or nomadic people, as is sometimes supposed, but, on the contrary, betrays an advanced stage of civilisation. Frequent allusion is made in them to towns and cities, to mighty kings, and their prodigious wealth. Besides agriculture, they mention various useful arts which were practised by the people, as the art of weaving, of melting precious metals, of fabricating cars, golden and iron mail, and golden ornaments. The employment of the needle and the use of musical instruments, are known to them. They also prove that the Hindus of that period were not only familiar with the ocean, but sometimes must have engaged in naval expeditions. They had some knowledge of medicine, and must have made some advance in astronomical computation, as mention is made of the adoption of an intercalary month, for the purpose of adjusting the solar and lunar years. Nor were they unacquainted with the vices of civilisation, for we read in these hymns of common women, of secret births, of gamblers and thieves. There is also a curious hymn, from which it would follow that even the complicated law of inheritance, which is one of the peculiarities of the existing Hindu law, was to some extent already in use at one of the periods of the R'igveda hymns. The institution of caste, however, seems at that time to have been unknown, for there is no evidence to prove that the names which at a later period were current for the distinction of caste, were employed in the same sense by the poets of these hymns.—See Wilson's *R'igveda*, vol. i., re-edited by F. E. Hall, vols. ii., iii.; and vol. iv., edited by E. B. Cowell (Lond. 1850—1866).

The only recension in which the Sanhitâ of the R'igveda has been preserved to us, is that of the *S'âkala* school; and the hymns themselves are arranged according to two methods, the one chiefly considering the material bulk, the other the authorship of the hymns. Both divisions, however, run parallel. According to the former, the whole Sanhitâ consists of eight *Asht'akas*, or eights; these, again, are divided into 64 *Adhyâyas*, or lessons; these into 2006 *Vargas*, or sections; and the Vargas into *R'ichs*, or verses, the actual number of which is 10,417, but, according to the statement of native authorities, seems at some other time to have amounted to 10,616 or 10,622.—According to the other method, the Sanhitâ is divided into ten *Man'd'alas*, or 'circles;' the Man'd'alas into 85 *Anuvâkas*, or 'sections;' these into 1017, and 11 additional, i. e., into 1028 *Sûktas*, or 'hymns,' and the hymns into *R'ichs*, or verses, the number of which coincides, of course, with that of the former arrangement. The number of *padas*, or words, in this Sanhitâ is stated as being 153,826.

In eight out of the ten Man'd'alas, the first hymn or hymns are addressed to *Agni;* the next hymn or hymns generally to *Indra;* and after these come hymns to the *Vis'we Devâs*—the deities collectively—or hymns to other special deities. The eighth Man'd'ala begins with hymns to Indra, and the ninth is chiefly devoted to Soma.

As for the authorship of the hymns, the second Man'd'ala belongs chiefly to that of *Gr'itsamada*, the third chiefly to that of *Vis'wâmitra*, and the fourth chiefly to that of *Vâmadeva*. The fifth was composed chiefly by *Atri* and members of his family; the sixth by *Bharadvâja* and members of his family; the seventh by *Vasisht'ha* and his kin; the first, eighth, ninth, and tenth by various R'ishis.—The text of the Sanhitâ has been edited in Roman characters by Professor Th. Aufrecht (Berlin, 1861); and the text, with the commentary of Sâyan'a, is in course of publication by Professor Max Müller, there having already appeared vols. i.—iv. of this edition (Lond. 1849—1862). Of translations, that by the late Professor H. H. Wilson, which was left by him completed in manuscript, and of which 4 vols. have already appeared in print (see above), follows the commentary of Sâyan'a, based on Hindu tradition; that begun by Professor Benfey in the Journal *Orient und Occident*, vols. i. and ii. (Gött. 1862—1864), is essentially speculative.

The Brâhman'a portion of the R'igveda is preserved in two works only—the *Aitareya Brâhman'a*, which consists of eight *Panchikâs*, or 'pentades,' each of these comprising five *Adhyâyas*, or 'lessons,' and all the Adhyâyas together, 285 *Khan'd'as*, or 'portions;' and the *S'ânkhâyana*, or *Kanshîtaki-Brâhman'a*, containing thirty *Adhyâyas*, also subdivided into a number of *Khan'd'as*. The following specimens, selected from the former, may illustrate the manner in which works of this category enjoin sacrificial rites and explain their secret meaning. The first relates to the ceremony of carrying the Soma (q. v.). 'The king Soma lived among the Gandharvas. The gods and R'ishis deliberated as to how the king might be induced to return to them. *Vâch*, the goddess of speech, said: "The Gandharvas lust after women. I (therefore) shall transform myself into a woman, and then you sell me to them (in exchange for Soma)." The gods answered: "No! how may we live without thee?" She said: "Sell me unto them; if you should want me, I shall return to you." Thus they did. In the disguise of a big naked woman, she was sold (by the gods to the Gandharvas) in exchange for Soma. In imitation (of this precedent), men drive away an immaculate cow of one year's age, this being the price at which they purchase the king Soma. This cow may, however, be rebought; for *Vâch* returned to the gods. Hence the Mantras, after Soma has been bought, are to be repeated with a low voice. After Soma has been bought, the goddess of speech is with the Gandharvas; but she returns as soon as the ceremony of carrying the sacred fire is performed.'

The following are the speculations of this Brâhman'a on the *Yûpa*, or sacrifical post, and the meaning of the sacrificial animal.

'(The theologians) argue the question: Is the *Yûpa* to remain standing (before the fire); or is it to be thrown (into the fire)? (They answer:) For him who desires cattle, it may remain standing.

(About this, the following legend is reported.) Once upon a time, cattle did not stand still to be taken by the gods for food. After having run away, the cattle stood still, and, turning towards the gods, said repeatedly: "You shall not obtain us. No, no!" Thereupon the gods saw that *Yûpa*-weapon which they erected. Thus they frightened the animals, which then returned to them. That is the reason that, up to this day, the sacrificial animals are turned towards the *Yûpa* (their head being bent towards the sacrificial post to which they are tied). Then they stood still to be taken by the gods for their food . . . . The man who is initiated (into the sacrificial mysteries) offers himself to all deities. Agni represents all deities, and Soma represents all deities. When the sacrificer offers the animal to Agni and Soma, he releases himself from being offered to all deities. Some say: "The animal to be offered to Agni and Soma must be of two colours, because it belongs to two deities." But this precept should not be attended to. A fat animal is to be sacrificed, because animals (compared to the sacrificer) are fat, and he (compared to them) is lean. When the animal is fat, the sacrificer thrives through its marrow. Some say: "Do not eat of the animal offered to Agni and Soma. Who eats of this animal, eats human flesh, because the sacrificer releases himself (from being sacrificed) by means of the animal." But this precept, too, should not be attended to. The animal offered to Agni and Soma was an offering to Indra, for Indra slew Vr'itra through Agni and Soma. Both then said to him: "Thou hast slain Vr'itra through us; let us choose a boon from thee." "Choose yourselves," answered he. But they chose this boon from him; and thus they receive (now as their food) the animal which is sacrificed the day previous to the Soma feast. This is their everlasting portion chosen by them; hence one ought to take pieces of it, and eat them.'—See M. Haug's edition and translation of the *Aitareya Brâhman'a* (vol. ii. pp. 59, 78), vols. i., ii. (Bombay, 1863).

The principal object for which the *Sâmaveda* was compiled is the performance of those sacrifices of which the juice of the Soma plant is the chief ingredient; and of such sacrifices the most important is the *Jyotisht'oma*, which consists of seven stages: the Agnisht'oma, Atyagnisht'oma, Ukthya, Shod'as'in, Atirâtra, Aptoryâma, and Vâjapeya; but the performance of the Agnisht'oma alone was considered obligatory for those who wished to derive the chief advantage accruing from the celebration of this grand ceremony; while its other six stages, though adding to the merits of the sacrificer, were deemed voluntary. At the performance of such Soma sacrifices, the verses of the Sâmaveda were intoned; and there are special song-books which teach the proper manner how to chant them. The Sanhitâ of the Sâmaveda is preserved in two recensions: in that of the *Rân'âyanîya*, and probably also the *Kauthuma* school. It consists of two parts: the first, the *Chhandograntha*, also called *Ârchika*, or *Pûrvârchika*, contains, in the present recension, 585 verses, which are arranged into 59 *Das'ati* or decades, these being divided into *Prapât'hakas*, or chapters, and the latter, again, into *Ardhaprapât'hakas*, or half-chapters. The second portion, called *Staubhika*, or *Uttarâgrantha*, or *Uttarârchika*, consists of 1225 verses, distributed over nine *Prapât'hakas*, which, too, are subdivided into *Ardhaprapât'hakas*. And there is this peculiarity in the Uttarâgrantha, that being for the most part arranged according to triplets of verses, the first verse of these triplets is frequently one which also occurs in the Ârchika portion. It is then called the *Yoni*, or parent verse, because the subsequent two, the *Uttarâ*, are symbolically its children, since they participate of all the modulations, stoppages, and other modifications which may occur in the chanting of the 'parent' verse. These modulations, &c. are taught in the *Gânas*, or song-books mentioned before, two of which, the *Veyagâna* and *Âran'yagâna*, relate to the Ârchika; and two others, the *Ûhagâna* and *Ûhyagâna*, to the Staubhika part. The text of the Sâmaveda-Sanhitâ, in the Rân'âyanîya recension, has been edited and translated by Dr J. Stevenson (Lond. 1842—1843), and by Professor Th. Benfey (Leip. 1848).

The number of *Brâhman'as* relating to this Veda is, by the native authorities, given as eight; and their names are: the *Praud'ha-*, or *Panchavins'a-*, the *Shad'vins'a-*, the *Sâmavidhi-*, or *Sâmavidhâna-*, the *Ârsheya-*, the *Devatâdhyâya-*, the *Vans'a-*, the *Sanhitopanishad-Brâhman'a*; and the *Upanishad*, which probably is the *Chhândogya-Upanishad*, and thus is ranked amongst the Brâhman'as. A later Brâhman'a, probably of modern date, and which is not mentioned by Sâyan'a, is the *Adbhuta-Brâhman'a*. The latter and the *Van'sa Brâhmana* have been edited by Professor A. Weber; the former in the *Indische Studien*, vol. iv. (Berlin, 1858); the latter in the *Abhandlungen der königlichen Akademie der Wissenschaften zu Berlin* (1858).

The history of the Yajurveda differs in so far from that of the other Vedas, as it is marked by a dissension between its own schools far more important than the differences which separated the schools of each other Veda. It is known by the distinction between a Yajurveda, called the *Black-*, and another, called the *White-Yajurveda*. Tradition, especially that of the Purân'as, records a legend to account for it. *Vais'ampâyana*, it says, the disciple of Vyâsa, who had received from him the Yajurveda, once having committed an offence, desired his disciples to assist him in the performing of some expiatory act. One of these, however, *Yâjnavalkya*, proposed that he should alone perform the whole rite; upon which, Vais'ampâyana, enraged at what he considered to be the arrogance of Yâjnavalkya, uttered a curse on him, the effect of which was, that Yâjnavalkya disgorged all the Yajus texts he had learned from Vais'ampâyana. The other disciples, having meanwhile been transformed into partridges (*tittiri*), picked up these tainted texts, and retained them. Hence these texts are called *Taittiriyas*. But Yâjnavalkya, desirous of obtaining other Yajus texts, devoutly prayed to the Sun, and had granted to him his wish—'to possess such texts as were not known to his teacher.' And because the Sun on that occasion appeared to Yâjnavalkya in the shape of a horse (*vâja*), those who studied these texts were called *Vâjins*. That part of this legend was invented merely to account for the name of the *Taittirîyas*, after whom a Sanhitâ and Brâhman'a of the Black Yajurveda, and for that of the *Vâjasaneyins*, after whom the Sanhitâ of the White Yajurveda is named, is clear enough. Nor is greater faith to be placed on it when it implies that the origin of this dissension ascended to the very oldest period of the Yajurveda; for there is strong reason to assume that the division took place even after the time of the grammarian Pân'ini (q. v.). See Goldstücker's *Pân'ini*, p. 130, ff. But so much in it is consistent with truth—that the Black Yajurveda is the older of the two; that the White Yajurveda contains texts which are not in the Black; and that, compared to the motley character of the former, it looks 'white,' or orderly. This motley character of the Black Yajurveda, however, arises from the circumstance, that the distinction between a Mantra and Brâhma'na portion is not so clearly established in it as in the other Vedas; hymns and matter properly

belonging to the Brâhman'as there being intermixed. This defect is remedied in the White Yajurveda; and it points, therefore, to a period when the material of the old Yajus was brought into a system consonant with prevalent theories, literary and ritual.

The contents of both divisions of the Yajurveda are similar in many respects. Two of the principal sacrifices of which they treat are the *Dars'apûrn'amâsa*, or the sacrifice to be performed at new and full moon, and the *As'wamedha*, or the horse-sacrifice, at the performance of which 609 animals of various descriptions, domestic and wild, were tied to 21 sacrificial posts. A *Purushamedha*, or man-sacrifice, unknown to the other Vedas, is also mentioned in it; its character, however, is symbolical.

The text of the Black Yajurveda is extant in the recension of two schools—that of *Apastamba*, to which the *Taittirîya Sanhitâ* belongs, and that of *Charaka*. The former, which is in course of publication—the first volume and part of the second having been already published, with the commentary of Mâdhavâchârya (Sâyan'a), by Dr E. Roer and E. B. Cowell in the *Bibliotheca Indica* (Calcutta, 1860—1864)—consists of seven *Kân'd'a*, or books, which comprise 44 *Prapât'haka*, or chapters, subdivided into 651 *Anuvâka*, or sections, and containing 2198 *Kan'd'ikâs*, or portions.

The *Vâjasaneyi-Sanhitâ*, or the Sanhitâ of the White Yajurveda, exists in the recension of the *Mâdhyandina* and *Kân'va* school. In the former—the text of which, apparently also with the commentary of *Mahîdhara*, has been edited by Professor A. Weber (Berlin, 1852)—this Sanhitâ has 40 *Adhyâyas*, or books, subdivided into 303 *Anuvâkas*, with 1975 *Kan'd'ikâs*.

The principal Brâhman'a of the Black Yajurveda is the *Taittirîya-Brâhman'a*, which, with the commentary of (Mâdhava) Sâyan'a, is in the course of publication by Baboo Rajendralâla Mitra—the first volume and part of the second having already appeared in print (Calcutta, 1860—1865) in the *Bibliotheca Indica*. That of the White Yajurveda is the *S'atapatha-Brâhman'a*, the most complete and systematic of all Brâhman'as. Its text, with a semblance of the commentary of *Sâyan'a*, has been edited by Professor A. Weber (Berlin, 1855).

The Atharvaveda has no circle of sacrifices assigned to it. Its object is, as observed before, to teach how to appease, to bless, to curse, &c. 'The most prominent characteristic feature of this Veda,' Professor Whitney, one of its editors, remarks, 'is the multitude of incantations which it contains; these are pronounced either by the person who is himself to be benefited, or, more often, by the sorcerer for him, and are directed to the procuring of the greatest variety of desirable ends. Most frequently, perhaps, long life, or recovery from grievous sickness, is the object sought; then a talisman, such as a necklace, is sometimes given, or, in very numerous cases, some plant endowed with marvellous virtues is to be the immediate external means of the cure; further, the attainment of wealth or power is aimed at, the downfall of enemies, increase in love or in play, the removal of petty pests, and so on, even down to the growth of hair on a bald pate.'—*Journal of the American Oriental Society*, vol. iii. p. 308. It has been surmised (Müller's *Ancient Sanscrit Literature*, p. 447, ff.) that the hymns of the Atharvaveda 'formed an additional part of the sacrifice from a very early time, and that they were chiefly intended to counteract the influence of any untoward event that might happen during the sacrifice.' This is possible; but the great importance which the adherents of this Veda themselves attach to it, is founded on other considerations than these. They argue, as appears from the treatise *Atharvan'arahasya*, mentioned above, that the three other Vedas enable a man to fulfil the *dharma*, or religious law but that the Atharva helps him to attain *moksha*, or eternal bliss. This doctrine is laid down, for instance, in the *Chûlika Upanishad* of this Veda, when it says: 'Those Brâhmans and others who know the science of the (neuter) Brâhman contained in the *Brahmaveda*, become merged in Brâhman;' and it is likewise inferred from other passages in the *S'aunaka Brâhman'a*. The name of *Brahmaveda* itself, by which this Veda is also frequently called, is therefore explained by them, not as implying the Veda which belongs to the province of the priest Brahman, but the Veda which contains the mysterious doctrine of Brahman, the supreme spirit, into which the human soul becomes finally absorbed. It is probable, therefore, that the very uselessness of the Atharvaveda for sacrificial purposes, and the reluctance which was felt to base its sanctity merely on its incantations and spells, invested it, in the mind of its followers, with a spiritual character, which was then fully developed in the numerous Upanishads (q. v.) now connected with it.

The text of the Atharvaveda is preserved only in the *S'aunaka* school. Its Sanhitâ consists, in the present edition of it, of 20 *Kân'd'as*, or books. Of these, the first 18 are subdivided into 34 *Prapât'hakas*, or chapters, with, altogether, 94 *Anuvâkas*, or sections, each containing a number of *mantras* (the 17th Kân'd'a consisting of a single Prapât'haka). The 19th Kân'd'a is not divided into Prapât'hakas, but into *Anuvâkas*, of which it contains seven; and the 20th, likewise divided into *Anuvâkas*, has nine, of which the third is subdivided into three *Paryâyas*.—The text of this Sanhitâ has been edited by Professors R. Roth and W. D. Whitney (Berlin, 1856).

The only existing Brâhman'a of this Veda is the *S'aunaka-* or *Gopatha-Brâhman'a*. 'That this Brâhman'a,' Professor Müller observes, 'was composed after the schism of the Charakas and Vâjasaneyins, and after the completion of the Vâjasaneyi-Sanhitâ, may be gathered from the fact, that where the first lines of the other Vedas are quoted in the Gopatha, the first line of the Yajurveda is taken from the Vâjasaneyins, and not from the Taittirîyas.'—*Ancient Sanscrit Lit.*, p. 452. Each of these Vedas received in time *Anukraman'îs*, or indices, which give the first word of each hymn, the number of verses, the names of the deities, the name and family of the poets, and the metre of every verse. The principal treatise of this kind is the *Sarvânukraman'î*, or 'The General Index,' ascribed to the authorship of *S'aunaka*. For the theosophical works which grew out of these Vedas, see the article UPANISHAD; and for the works which were composed in order to secure a correct reading and understanding of the Vedic texts, and a correct performing of sacrificial acts, see the article VEDÂNGA.—At a later period the name of Veda was also bestowed on *Itihâsas*—legends or legendary works—and *Purân'as* (q. v.), collectively; but in this sense it never obtained real currency. *Upavedas*, or minor Vedas, are also mentioned in the *Charan'avyûha* and other works, and explained by them in the following manner. The Upaveda of the R'igveda, they say, is the *Âyurveda*, or the Veda on medicine—probably the well-known works of Charaka and Sus'ruta; the Upaveda of the Yajurveda is the *Dhanurveda*, or the Veda on archery; the Upaveda of the Sâmaveda is the *Gândharvaveda*, on music; and the Upaveda of the Atharvaveda is the *S'ilpas'âstra*, a work on mechanical arts, or, according to others, the *Arthas'âstras*, works on practical subjects, comprising polity

mechanical science, the training of elephants and horses, and fencing.

In the preceding brief outline of the four Vedas, the question as to the date at which they were composed has not been raised, because, in the present condition of Vedic philology, an answer to it could only be hypothetical. From astronomical facts, based on a statement in a Vaidik calendar, Colebrooke concluded that this calendar was written in the 14th c. before the Christian era (*Miscell. Essays*, vol. i. pp. 109, 110); and though subsequent writers have questioned the full correctness of this conclusion, those most reliable nevertheless admit that the error, if any, could not lessen the antiquity of this calendar by more than 100 or 200 years. As this calendar must have been composed after the R'igveda had been arranged, and as such an arrangement itself must be posterior to the date of its last hymn, a full scope is left for imagination to fill up these intervals. But let it be understood that imagination alone would have to perform this task, since scientific research has as yet not yielded any means to check it, or prompt it on, as the case may be; nor is there any real prospect that future discoveries in Sanscrit literature will supply this want. A safer basis, however, may be looked for, if future research restricted itself to the question as to the *relative* age of these Vedic writings. Much valuable evidence has been already brought forward in this respect to prove that there are R'ishis ancient, and less ancient (see, for instance, J. Muir's *Original Sanscrit Texts*, vol. ii. p. 205, ff.); that there are R'igveda hymns older than others (for instance, in Müller's *Ancient Sanscrit Literature*); but, on the other hand, much confusion has also been produced by starting a theory, that all the Brâhman'as belong to one period, and all the hymns to another period preceding it, of which, again, two stages were thought to be discernible, and by assigning dates to the Brâhman'a period, as well as to each of the two stages of the Mantra period. For, apart from the purely imaginary value of such dates, and apart from the circumstance, that no evidence whatever has as yet been brought forward to justify an assumption of only two stages of hymns, each of which would comprise only 200 years, it is clear that the similarity of subject-matter alone—such as it marks the literary character of the Brâhman'as —cannot be a criterion for determining that *all* the Brâhman'as must be more recent than *all* the Sanhitâs. That a Brâhman'a of the R'igveda must be posterior to those hymns of the R'igveda Sanhitâ which it mentions, but to those alone—again, that a Brâhman'a of the Sâmaveda must be younger than the hymns of the Sâmaveda on which it relies, and so on—cannot be matter of doubt; but as the Sanhitâ of the Sâmaveda, for instance, must be more recent than that of the R'igveda, and as no act whatever has been adduced to shew why the Aitareya Brâhman'a, or other Brâhman'as of the R'igveda, could not have appeared before a Sâmaveda-Sanhitâ was made, and so forth in the case of the other Vedas, it follows that it would be entirely unsafe to infer that all the Brâhman'as must be more recent than all the Sanhitâs; nay, even that all the Brâhman'as must be later than all the hymns of the R'igveda, since not all of them need have existed before the oldest Brâhman'a of this Veda was composed. A result like this is, unhappily, purely negative, but it may have the advantage of counselling caution and stimulating research.

VEDÂNGA—from Veda (q. v.) and *anga*, limb; hence, literally, 'the limb of (the body of) the Veda'—is the name of six Sanscrit works, the object of which is to teach how to read and understand correctly the Vedic texts, and how to apply them correctly to sacrificial purposes. Whether the number of these works was originally the same as it now is, and already was at the time of the Upanishads, may be doubtful. Tradition mentions the following Vedângas: 1. *S'ikshâ*, or the science of proper pronunciation. It is represented by a short treatise of 35, or, in another recension, of 59 verses, which explains the nature of letters, accent, and pronunciation, and is ascribed to *Pân'ini* (q. v.). 2. *Chhandas*, or (a work on) metre, which is ascribed to *Pingala*. 3. *Vyâkaran'a*, or grammar, by which native authorities understand the celebrated work of *Pân'ini* (q. v.); but never those short books, especially concerned in Vedic peculiarities, called *Prâtis'âkhyas*, the existing representatives of which, in all probability, are posterior to Pân'ini (see Goldstücker's *Pân'ini*, &c., p. 183, ff.). 4. *Nirukta* (q. v.). 5. *Jyotisha*, or astronomy. 'Its chief object is to convey such knowledge of the heavenly bodies as is necessary for fixing the days and hours of the Vedic sacrifices.' 6. *Kalpa*, or works on the Vedic ceremonial, which systematise the ritual taught by the Brâhman'a portion of the Veda, omitting, however, all legendary or mystical detail. They are composed in the Sûtra style. See SÛTRA. The Kalpa, or 'Sranta, Sûtras belonging to the R'igveda are the *As'walâyana-*, *Sânkhâyana*, and *S'aunaka Sûtras;* those relating to the Sâmaveda, the *Mas'aka-*, *Lâtyâyana-*, and *Drâhyâyan'a* Sûtras; those of the Black Yajurveda, the *Apastamba-*, *Baudhâyana-*, *Satyâshâd'ha-*, *Hiran'yakes'in-*, *Mânava-*, *Bhâradvâja-*, *Vâdhûna-*, *Vaikhânasa-*, *Laugâkshi-*, *Maitra-*, *Kat'ha-*, and *Vârâha* Sûtras. The White Yajurveda has only one Kalpa, or 'Sranta, Sûtra connected with it, the *Kâtyâyana* Sûtra, and the Atharvaveda likewise only one, the *Kus'ika Sûtra.*—At a later period, these works were supplemented by a similar class of works, which, however, merely describe the domestic ceremonies, viz., 'the marriage rite, the rites to be performed at the conception of a child, at various periods before his birth, at the time of his birth, the ceremony of naming the child, of carrying him out to see the sun, of feeding him, of cutting his hair, and lastly, of investing him as a student, and handing him to a guru, under whose care he is to study the sacred writings.' Works of this kind are called *Gr'ihya-Sûtras* (from *gr'iha*, house), and to these, again, were added the *Sâmayâchârika-Sûtras* (from *samayâchâra*, conventional practice), which treat of customs sanctioned by the practice of pious men, but not enjoined or expressly stated in the Gr'ihya-Sûtras. The two last classes of Sûtras, which are not comprised amongst the Kalpa works, then grew into the *Dharma-s'âstras*, or law-books, of which that of *Manu* is the chief representative. See Müller's *Ancient Sanscrit Literature*, p. 108, ff.

VEDÂNTA (from the Sanscrit *veda*, and *anta*, end; hence, literally, 'the end or ultimate aim of the Vedas') is the second great division of the *Mîmânsâ* (q. v.) school of Hindu philosophy. It is chiefly concerned in the investigation of *Brahman* (neuter), or the Supreme Spirit, and the relation in which the universe, and especially the human soul, stands to it; and in contradistinction from the *Pûrvamimânsa*, or the investigation (*mîmânsâ*) of the former (*pûrva*) part of the Vedas—viz., the Sanhitâ, and especially the *Brâhman'as* (see VEDA)—which contain the *dharma*, or religious law (see MÎMÂNSÂ), it is also called *Uttara-mîmânsâ*, or the investigation (*mîmânsâ*) of the latter (*uttara*) part of the Vedas—viz., *Âran'yakas* and *Upanishads* (q. v.), which treat of (the neuter) *Brahman*, or the Supreme Spirit [not to be confounded with (the masculine) *Brahman*, or the god of the mythological *Trimûrti* (q. v.)]. Some

times, the name given to it is *S'ârîraka-mîmânsâ*, or the investigation of the soul (s'ârîraka). In its method, the Vedânta differs from the Nyâya (see NYAYA and VAIS'ESHIKA) by endeavouring to explain the universe as a successive development from one ultimate source or principle—whereas the Nyâya, in both its divisions, treats of the objects of human knowledge of which the universe is composed, under different topics, unconcerned about their mutual relation of effect and cause; and from the *Sânkhya* (see SANKHYA and YOGA), it is distinct, inasmuch as that system is based on the assumption of a duality of principles whence the universe derives its origin.

The object-matter of the Vedânta is the proof that the universe emanates in a successive development from a Supreme Spirit or soul, which is called *Brahman*, or *paramâtman;* that the human soul is therefore identical in origin with Brahman; that the worldly existence of the human soul is merely the result of its ignorance of this sameness between itself and the Supreme Spirit; and that its final liberation or freedom from Transmigration (q. v.) is attained by a removal of this ignorance, that is, by a proper understanding of the truth of the Vedânta doctrine.

According to this doctrine, *Brahman* (neuter) is both the efficient and material cause of the world, creator and creation, doer and deed. It is one, self-existent, supreme, as truth, wisdom, intelligence, and happiness; devoid of the three qualities, in the sense in which created beings possess them; and at the consummation of all things, the whole universe is resolved or absorbed into it. From Brahman individual souls emanate, as innumerable sparks issue from a blazing fire. The soul, therefore, is neither born, nor does it die; it is of divine substance, and as such, infinite, immortal, intelligent, sentient, true. Its separate existence, as distinct from Brahman, is the cause of its ignorance; and this ignorance, which consists in regarding the world as a reality capable of subsisting without Brahman, has a double power—that of enveloping and projecting. By means of the former, it makes the soul liable to mundane vicissitudes, as to the sensations of pleasure, pain, &c. The projective power of ignorance, when encompassing the soul in its fourth condition, or that of pure intellect (its other conditions are: waking, dreaming, and dreamless sleep) produces out of the darkness which then prevails the five subtile elements—viz., *ether*, which is the substratum of the quality sound; *air*, which arises from ether, the substratum of touch; from air, *fire or light*, the substratum of colour; from light, *water*, the substratum of savour; and from water, *earth*, the substratum of smell. From these subtile elements are then produced seventeen subtile bodies and the five gross elements. The former, also called *linga-s'arîra*, because they are bodies (*s'arîra*) which impart to existing beings their individual character (*linga*), are *the five organs of perception*—viz., the organs of hearing, touch, sight, taste, and smell, which arise severally from the *pure* or inactive particles of each of the subtile elements; further, *two intellectual organs*, which are produced from the *mingled pure*, or inactive particles of the subtile elements—viz., *buddhi*, understanding, the function of which is to arrive at a certainty or conclusion, and *manas* (an organ of volition and imagination), the function of which consists in willing and doubting—thinking and referring the external objects to one's own self, being two functions common to both of them; lastly, *the five organs of action*—viz., the voice, the hands, the feet, the organ of excretion and that of generation, which are severally produced from the *foul* or *active* particles of each of the subtile elements; and *the five vital airs*, which are produced from the *mingled foul* or *active* particles of the subtile elements—viz., the air breathed forth, which has its place in the fore-part of the nose; the air breathed downwards, which has its place in the lower intestines; the air which circulates through the whole body; the ascending air, which has its place in the throat, and the descending air in the middle of the body, which causes assimilation and digestion of food, produces semen, excrements, &c. (Later Vedântists assume ten such vital airs—viz., besides the foregoing, the airs which severally cause retching, winking, hunger, yawning, and fattening.) The five *gross elements* are the five subtile elements, when, according to a theory derived from a scriptural text, they have become so divided and combined that each of them retains a preponderating portion of itself, and consequently of the quality of which it is the substratum—as ether of sound, &c.—and besides smaller portions of the other subtile elements, and the qualities of which they are the substrata. From these gross elements then arise the various (mythological) worlds, and this world too, with bodies which are distinguished as viviparous, or those produced from a womb, as men, beasts, &c.; oviparous, or those produced from an egg, as birds, snakes, &c.; those generated by 'sweat' or hot moisture, as lice, gnats, &c.; and those germinating, as creepers, trees, &c. The soul, when existing in the body, is encased in a succession of 'sheaths.' The first or interior 'sheath' consists of *buddhi*, associated with the organs of perception; the second, of *manas*, associated with the organs of action; and the third, of the vital airs together with the organs of action. These three 'sheaths' constitute the subtile body of the soul, which attends the soul in its transmigrations; and the collective totality of such subtile bodies is the Supreme soul, as regarded in its relation to the world; when it is also called 'the soul which is the thread,' or passes like the thread through the universe, or Hiran'yagarbha, or life. The fourth and exterior 'sheath' of the soul is composed of the gross elements; and the collective aggregate of such gross bodies is the gross body of the deity. This whole development being the result of ignorance, the soul frees itself from its error by understanding that the different stages in which this development appears, do not represent real or absolute truth; and when its error has completely vanished, it ceases to be re-born, and becomes re-united with Brahman, whence it emanated. But since the means of arriving at a final deliverance can only be the complete mastery of the truths of the Vedânta, other means, such as the performance of sacrifices or other religious acts enjoined by the Vedas (q. v.), or the practice of Yoga (q. v.), cannot lead to the same result. They may be meritorious, and are even recommended as such, but can effect only an apparent liberation. Of this, there are two kinds: one liberation which is effected in lifetime, and enables a man to perform supernatural actions or wonders, as the evocation of the shades of progenitors, going anywhere at will, and similar feats; and another which takes place after death, and enables the soul, not divested of its subtile body, to reside in heaven; but after a time its effect ceases, and the soul has to renew its mundane existence. In order to fit the mind for meditating on these truths, various moral duties are enjoined, and various practices are recommended, especially by later Vedânta writers. Thus, the student of the Vedânta is told not to hurt a sentient being, to speak the truth, not to steal, to practise continence, and not to accept gifts; to remain pure and content, to do penance, and to study the Vedas; also to remain in certain postures, to practise various modes of suppressing his breath, and the like. These injunctions,

however, are extraneous to the doctrine itself, and appear to be a compromise with the old orthodox faith, which requires the performance of religious acts, and a later stage of it, which favours such austere practices as are especially known by the name of Yoga (q. v.). The doctrine of *bhakti*, or faith, does not belong to the older Vedânta; it is, however, an interesting feature of the later periods of this philosophy; and the same observation applies to the doctrine of *Mâyâ*, or illusion, according to which the world has no reality whatever, but is merely the product of imagination; for the older Vedânta, as will have been seen, merely teaches that the world is not *the truth*, but does not deny its material reality.

The oldest work on this philosophy is attributed to *Bâdarâyan'a*, or *Vyâsa* (q. v.), and is written in the Sûtra (q. v.) style; it is called the *Brahma-Sûtra;* it consists of four *adhyâyas*, or lectures, each subdivided into four *pâdas*, or chapters; each pâda containing a number of Sûtras. The number of the latter is 558, and that of the *adhikaran'as* or topics treated in them 191. The most important commentary on this work is the *S'ârîrakamîmânsâ-bhâshya*, by *S'ankarâchârya* (q. v.); and this commentary, again, has been commented on by a great variety of writers. The text of the Sûtras and this commentary have been edited at Calc. 1818; and the text with this commentary, and a gloss on the latter, by Govindânanda, in the *Bibliotheca Indica*, by Pandita Râma Nârâyan'a Vidyâratna, Calc. 1863. Of the great number of other commentaries on the Brahma-Sûtras, mention may be made only of that by *Râmânuja* (q. v., under VAISHN'AVAS), and of a short but very lucid one, by *Anûpanârâyan'as'iroman'ibhat't'a* (edited at Calc., without date). Amongst elementary treatises on the Vedânta, the most popular is the *Vedântasâra*, by *Sadânanda*, which, with the commentary of *Râmakr'ishn'a Tîrtha*, has been edited at Calc. 1829, and with this and another commentary by *Nr'isinhasaraswatî*, at Calc. 1849. It has been edited and translated also by the late Dr J. R. Ballantyne (*A Lecture on the Vedânta, embracing the Text of the Vedânta Sâra*, Allahabad, 1850), who also translated the beginning of the Brahma-Sûtras.—A very useful compendium of the *Adhikaran'as*, or topics, is the *Adhikaran'amâlâ*, by *Bhâratîtîrtha*, which, with the commentary of *S'rî Ânandachandra-Vedântavâgîs'a*, has been edited, Calc. 1862, and as an appendix to the Brahma-Sûtras, with extracts from this commentary, in the *Bibliotheca Indica*, 1863.

VEDETTES are mounted sentinels, placed about 100 yards in advance of the outposts of an army, to keep a strict watch upon the enemy's movements, and to signal immediately the approach of danger. They should be placed two together.

VEER, in Sailing, is to pass from one board to the other, by bringing the stern to windward. It is therefore the same action as *Gybing* (q. v.).

VEGA, GARCILASO DE LA. See GARCILASO.

VEGA-CARPIO, LOPE FELIX DE, a celebrated Spanish poet, was born at Madrid on the 25th November 1562. From his very infancy, he is said to have given promise of extraordinary talent. Like Pope, he 'lisped in numbers.' On the death of his father, the family, originally a good one, fell into great difficulties, and was broken up. The young Lope fell to the charge of his uncle, the Inquisitor, Miguel del Carpio, who spared no pains to give him a good education. He was sent to the Imperial College at Madrid, and seemed to be progressing quietly towards the holy state, to which, by his uncle, he was destined, when an odd whim struck the lad, and, being then fourteen, he went off on a roving expedition with a comrade. But he and his companion were speedily arrested as thieves on their trying to effect the sale of a chain of gold (probably stolen from Lope's uncle), and sent back to Madrid. The returning prodigal was but coolly received by his reverend relative, who declined to further concern himself with a nephew of such distinctly *lay* propensities. He, in consequence, became a soldier; and in 1577 served at Terceira against the Portuguese. After this, we find him taken in hand by Geronimo Manrique, Bishop of Avila, who sent him to finish his studies at the university of Alcala. Here he was again ripening for holy orders, and was nearly in fact ripe, when again the passion of the vagabond drove him out upon the world a pervert. For some time, at this period of his life, Lope disappears from public view; and probably his adventures were of the kind which a discreet biographer will always permit his hero to prosecute as far as possible in private. It is understood that in his dramatic romance, *Dorothea*, he afterwards favoured the world with a sketch of himself and of these his early experiences; and if this is in detail to be taken as history, Lope, on his own shewing, must have been no more a model of propriety than certain other great poets who might be named. Towards 1585, we find him again at Madrid, attached to the person of the young Duke of Alva, for whom he composed the piece entitled *Arcadia*, a tedious pastoral, with verses interspersed, which only in detached passages displays his brilliant ability. About this time, he married a lady of condition, by name Isabella de Urbino; but his domestic felicity was speedily cut short by a misadventure. Having had some difference with a gentleman of court, he satirised him in a filthy ballad; and on finding that he took it amiss, gave him satisfaction by running him through the body. For this he was thrown into prison, and afterwards exiled to Valencia. He returned to Madrid as soon as he could with safety, and soon after lost his wife, whom he is said to have tenderly loved. Grief for her death, complicated with want of success in another of his little love-affairs, drove him to join the famous *Armada*, then being fitted out for the conquest of England. Through the perils of this disastrous expedition Lope came with a whole skin, and in 1590 was again safe in Madrid. A brother, to whom he was much attached, and who sailed as an officer in the same vessel, had not the same luck, but died during the voyage. It is a characteristic trait, that Lope—who, whatever else he may be doing, must always be conceived as flooding out continuous torrents of verse—composed, amid the distractions of tempest and battle, a long poem, the *Hermosura de Angelica*, which, as a continuation of the *Orlando Furioso* of Ariosto, has found favour even with express admirers of that poet. Shortly after his return, he became secretary to the Marquis of Malpica, and subsequently to the Count of Lemos, whose service he quitted soon after his marriage, in 1597, to Donna Juana de Guardio, resolving thenceforward to trust solely to literature for his livelihood. This he could well do with every confidence, as already one of the most admired authors of the day, and by far the most popular dramatist. The years immediately succeeding, he himself frequently afterwards refers to as the happiest period of his life; but it was not of very long duration. At the age of seven, his son Carlos died; and soon after, in giving birth to a daughter, his wife also died. The double blow was severe. A mistress, indeed, remained to console him, Donna Maria de Luxan, by whom he had a boy and girl, the latter of whom, Marcela, was the

most beloved of all his children. But he had no doubt got a little tired of Donna Maria; and about this time he began to turn his thoughts seriously to religion. Having had as much vice as he cared for, he considered he had reached the point in his career at which piety might begin to be prosecuted with advantage. Accordingly, after an interval of devout preparation, he became, in 1609, a priest of the order of St Francis. Of his zeal in his new functions, there is evidence in the fact, that in January 1623, he took prominent part in the ceremony of burning a heretical brother of his order. As to his performance of priestly duty otherwise, strictly thus much is known, that, with his old unremitting assiduity, he continued to pour forth poems and dramas, not always of a clerical or decent kind. During his last years, he fell into a profound religious melancholy. Despite the decay of his strength, he was rigorous in keeping himself up to the severest mark of discipline; in particular, he scourged himself terribly. Finally, in the beginning of August 1635, he gave himself a scourging so terrible, that the walls of the chamber were found bespattered with his blood; and some days after he died of it, at the ripe age of 73. If the poet in his later days thus exercised a little severity with himself, we may allow him to have been the best judge as to how far the peccadillos of his earlier ones might deserve it.

Lope was the idol of his contemporaries; and on the fruits of his labour, he lived in Madrid in what might be called splendour, when the really far greater Cervantes was starving in the same street. To such an extent was the popular admiration of him carried, that his very name became a synonym of excellence; and people spoke of a Lope jewel, a Lope poem, or the like, as one of unsurpassable perfection. At this day, we smoke what, as a Lope (Lopez) cigar, is understood as of superior quality; and it seems not at all unlikely that the name is derived from the poet deceased some centuries. In one quality, at least, Lope must be held to have surpassed all other poets—his productiveness was something portentous, and without parallel. Setting aside his other multitudinous performances, the dramas on which his popularity mainly rested, and which have since perpetuated his fame, have been calculated to number not less than 1800. He himself, in one of his latest works, more modestly puts them at something over 1500, and assures us that to write a whole drama in a day was no unusual feat with him. Even if we suppose in this something of the fabulous, there remain in print between five and six hundred of these pieces, to testify to his enormous fecundity; and it is certain that many more of his plays were acted, which have not in this form survived. The quantity of his work considered, its quality is not much less surprising. His fertility of invention is marvellous; the ease and grace of his versification are unsurpassed in the language in which he writes; and his pieces, even when slight in substance, are instinct with life and dramatic movement. In deep and serious qualities he is deficient, on which ground he is now ranked below his immediate successor, and some time contemporary, Calderon. With this single exception, he remains, however, the chief ornament of the Spanish stage, and a not inconsiderable figure in the dramatic literature of the world. An intelligent and full survey of his works, so far as the infinity of them permits it to be full, will be found in Ticknor's *History of Spanish Literature*, to which readers are referred.

VE'GETABLE, in a scientific sense, is a term synonymous with plant. Organic nature is divided into the ***Animal Kingdom*** (q. v.) and the ***Vegetable Kingdom***. See PLANT. The word vegetable is derived from the Latin *vegetus*, lively, or healthy. *Vegetation* is the term employed to denote the growth of plants.

VEGETABLE CHEMISTRY, or the Chemistry of Plants, is so extensive a subject that it is impossible here to give much more than an enunciation of the most important propositions, without entering into full proofs or details. On submitting to incineration a plant which has been dried at a moderate heat till it ceases to lose weight, we find that the residue, which consists of mineral salts and a little carbon, is much lighter than the original plant, the portion which is burned off, or apparently lost, corresponding to the organic constituents of the plant. Hence every plant, like every animal, is composed of *organic* and *mineral* or *inorganic constituents*. While the mineral constituents of the plant are also found in the crust of the earth, the organic constituents are primarily formed in the plant itself from inorganic matters, viz., from *water*, *atmospheric air*, and the *soil*, which collectively may be termed the food of plants.

The following general principles may be laid down regarding the organic constituents which mainly contribute to form the bulk of the body of the plant. (1.) All organic constituents of plants contain *carbon*. (2.) All such organic constituents contain *hydrogen*. Some of them, as, for example, many ethereal or volatile oils, consist solely of these two elements. (3.) The greater proportion of these compounds contain *oxygen* in addition to the two preceding elements. To this class belong those constituents of plants which are at the same time of the most general diffusion and of the greatest physiological and economic importance; namely, the so-called *carbo-hydrates*, which consist of carbon combined with hydrogen and oxygen in the exact proportion in which the last two elements form water. Under this title are included cellulose, starch, gum, &c. Other organic constituents contain not only carbon with hydrogen and oxygen in the above ratio, but an excess of oxygen. In this category may be placed almost all the *organic acids*, many *ethereal oils*, *wax*, the *resins*, many of the so-called *glycosides*, and the *fats*. (4.) With the above elements, *nitrogen* is associated, to form two very important groups of constituents, viz., the *organic bases* or *alkaloids*, and the *albuminates* or *proteine bodies*. Although the nitrogenous groups never form more than a small part of the mass of a plant, nitrogen is never altogether absent from a plant. (5.) In association with all the above-named elements, *sulphur* in small quantity is present in the albuminates of all plants; in association only with carbon and hydrogen, it occurs in oil of garlic and oil of asafœtida; and when combined with carbon, hydrogen, and nitrogen, it has been as yet only found in oil of mustard. Whether *phosphorus* in very minute quantity occurs in any of the vegetable albuminates, is still uncertain.

The inorganic constituents which are found in the ashes of all plants are: *potash*, *soda*, *magnesia*, and *lime*, in combination with *phosphoric*, *sulphuric*, *hydrochloric*, and *carbonic acids*, and additionally, *iron*, *manganese*, and *silica*, with traces of *fluorine*; while the marine plants or sea-weeds contain also appreciable quantities of *bromine* and *iodine*. *Alumina* and *baryta* are also occasionally found, as also are *nitrates* in certain plants. The carbonates almost always found in the ash are, as is well known for the most part formed by the action of the incineration upon the salts of the vegetable acids, such as the acetates, citrates, &c., and probably in some other respects, the arrangements of the constituents of the ash are not precisely identical with

those of the mineral ingredients while existing in the actual plant. Amongst the most essential of the inorganic constituents is *water*, which acts as a solvent for the matters dissolved in the vegetable juices, and forms a very preponderating part of the mass, sometimes amounting to from 86 to 96 per cent. of the whole plant. From the preceding remarks, it is obvious that the nutrition and development of plants are dependent on their absorbing *carbon-compounds*, *hydrogen-compounds*, *nitrogen-compounds*, *sulphur-compounds*, *water*, and such *inorganic compounds* as yield the necessary inorganic constituents in a form capable of assimilation; together with the presence of *oxygen*, which is required for the formation of organic oxygenous compounds.

The assimilation of *carbon* first claims our attention. The composition of the atmospheric air, from whatever part of the earth's surface it is taken, is, as is well known, constant, in so far as the relative volumes of oxygen and nitrogen are concerned; while the variations in the carbonic acid, except when there are obvious causes for an excess (as, for example, an over-crowded room), are very slight, and, as a general rule, deviate scarcely at all from 4 volumes in 10,000 of air. Yet causes disturbing this uniformity are perpetually at work. Professor Mulder, adopting Lavoisier's and Davy's experiments, according to which a man consumes about 26 cubic feet of oxygen in 24 hours (and later observers place the daily quantity at 45 cubic feet), calculated his yearly consumption at more than 9500 feet. Considering the enormous numbers of men and animals on the surface of the globe, and the lamps, fires, furnaces, &c. ever burning, the atmosphere would apparently soon cease to be fit for the support of life (1) in consequence of the great diminution of oxygen, a gas essential to life, and (2) in consequence of the great excess of carbonic acid, a gas deleterious to life. The cause of this marvellous uniformity of atmospheric air under these circumstances is that function of plants by which they absorb their carbon. It is to the experiments and observations of Priestley in 1771, Ingenhousz in 1776, Senebier in 1807, and many later observers, that we are indebted for the knowledge of the great general fact, that plants take up the carbonic acid from the air, reduce it in their organism, and retain the carbon for the composition of their own organisms, while they restore the oxygen gas to the atmosphere. It is chiefly by the leaves, which may be regarded as the respiratory organs, that this process is carried on. It is needless here to notice the questions as to whether it is only during light, or constantly, that these changes go on; whether different rays of the spectrum act with more or less power in liberating the oxygen, &c. Independently of the proof afforded, for example, by placing green plants in a mixture of 70 parts of common air and 30 parts of carbonic acid, and finding that, in the course of four hours, the carbonic acid has been almost entirely replaced by oxygen, we have obvious evidence in the case of lichens growing on a naked rock, that the carbon which they contain must be obtained from the atmosphere. In the case of aquatic plants, the process is identical, the atmospheric air being dissolved in the water. Carbon, in some form of combination or other, probably forms about two-thirds of the weight of a dried plant. The assimilation of *hydrogen* from the decomposition of water in and by the plant, is not capable of the same direct proof as that of carbon; but there are strong grounds for believing in its occurrence. This view is supported by the composition of wax, the resins, volatile oils, &c., and indeed it is difficult to see from what other source the hydrogen could be derived. In that case, the water, like the carbonic acid, contributes its oxygen to the air. The *nitrogen*, which enters into certain constituents of plants, is derived from ammonia, and not, as might have been supposed, directly from the air, of the volume of which it forms about four-fifths. It has been shewn by the direct observations of Boussingault, that plants cannot assimilate nitrogen, that those which have been made to absorb it by placing their roots in nitrogenous water, throw it off unchanged, and that vegetation cannot exist in a soil which contains no substances readily convertible into ammonia. The indifference of nitrogen to other elements, and the extreme readiness with which ammonia becomes decomposed, and enters into different combinations (the amides, imides, amido-acids, compound ammonias, and probably also the albuminates, being derivatives of it), together with the conclusion we draw from the action of liquids containing ammonia, or matter convertible into it, as gas-liquid, fluid sewage, &c., confirm this view. The ammonia taken up by plants is obtained partly from the air, and partly from the soil. In the air it is formed after thunderstorms, and it is further supplied to the atmosphere by putrefactive processes, animal excretions, and volcanic action. It is indeed found in snow and in all rain-water, and is thus conveyed to the soil. Although direct experiments shew that the air contained in the pores of the soil is richer in ammonia than ordinary atmospheric air, it is easy to shew that a plant can derive its ammonia from the latter alone, by a reference to the vegetation on naked rocks, or by growing plants in powdered charcoal duly moistened with rain-water. Hence both air and soil contribute the ammonia from which the nitrogen is fixed in the plant. The *oxygen* which occurs in the various constituents of the plant is derived from the decomposed carbonic acid and water, and corresponds to the difference between the amount contained in those absorbed compounds and the amount liberated to the atmosphere. The *sulphur* that occurs in the albuminates and certain ethereal oils must be derived from the soil, since it does not occur either free or in combination in the air; and as the only form in which it is found in common soil is as sulphates, plants must have the property of decomposing these salts, and appropriating their sulphur after reduction. Extensive experience has proved that certain *inorganic constituents* are as indispensable to the life and development of the plant, as the organic elements we have been considering; and further, that special plants require special inorganic constituents. The two following facts seem well established: (1) that the roots of plants exert a special selective power, and absorb some salts, and reject others that are also in solution in the water of the soil; and (2) that the top or vegetable soil has the power of absorbing and retaining the most necessary mineral ingredients, and does not allow them to be carried deep into the ground by the rain; but for the discussion of this subject, we can only refer to the experimental researches of Liebig, Mulder, Huxtable, Way, &c. It would be altogether out of place to enter into the consideration of the prodigious synthetic and analytic power of the vegetable cells; we shall merely indicate how some of the most important vegetable compounds are probably formed, beginning with the *vegetable acids*. 'Even,' says Professor Gregory, 'when carbonic acid and water are brought together in the cell, this is not enough. There must be present, first, albuminous matter, without which no active cell can exist; secondly, mineral matter, especially alkalies, phosphates, and salts. All these conditions being fulfilled, and light being admitted, we may suppose the first organic

acid formed to be oxalic acid, the least complex of all.'—*Organic Chemistry*, 4th ed. p. 541. Putting it in the briefest terms, the cell separates 1 equivalent of oxygen from 2 equivalents of carbonic acid, and yields 1 equivalent of *oxalic acid*, or $2(H_2CO_3) - O = H_4C_2O_5 = C_2H_2O_4 + H_2O$. Two equivalents of dry oxalic acid, $C_2H_2O_4$, by taking up 1 equivalent of water, and losing 3 equivalents of oxygen, yield *malic acid*, $C_4H_6O_5$. *Tartaric* and *citric acids* are capable of a similar production. Thus 2 equivalents of dry oxalic acid, combining with 1 of water, and losing 2 of oxygen, yield tartaric acid, $C_4H_6O_6$; and similarly, 3 equivalents of dry oxalic acid, combining with 1 of water, and losing 5 of oxygen, yield hydrated citric acid, $C_6H_8O_7$. In like manner, every vegetable acid, and every one of the neutral compounds of carbon, hydrogen, and oxygen, may be derived from some less complex compound, containing mere hydrogen than itself; or it may be supposed to be derived directly from carbonic acid and water, oxygen being, on every supposition, given off. 'As the proportion of oxygen to carbon diminishes, the acids become weaker, till the oxygen exactly suffices to form water with the hydrogen, when we have either very feeble acids, or neutral bodies, such as sugar, gum, and starch. As the oxygen is still further diminished, we have neutral, bitter, and acrid compounds, or coloured bodies, or such as yield colouring matters, with ammonia and oxygen; further on still, we have aromatic oils, and volatile, quasi-resinous, crystallisable acids; then resins; and lastly, when all the oxygen is expelled, certain oils, which are carbo-hydrogens.'—Gregory, *op. cit.*, p. 543. Although each individual substance is doubtless in reality derived from some substance only a little less complicated than itself, the final result, in so far as shewing their mode of construction is concerned, is the same as if they were all obtained directly from carbonic acid and water. The following tabular view (compiled by Gregory) will serve to shew how all the leading groups of vegetable compounds are produced from carbonic acid and water by deoxidation:

SUBSTANCES FORMED. Name.	Formula.	=	Carbonic Acid.	+	Water.	—	Oxygen.
1. *Vegetable Acids*—							
Tartaric acid,	$C_4H_6O_6$	=	$4CO_2$	+	$3H_2O$	—	50
Malic acid,	$C_4H_6O_5$	=	$4CO_2$	+	$3H_2O$	—	60
Citric acid,	$C_6H_8O_7$	=	$6CO_2$	+	$4H_2O$	—	90
2. *Carbo-hydrates*—							
Cellulose,	$C_6H_{10}O_5$	=	$6CO_2$	+	$5H_2O$	—	120
Starch,	$C_6H_{10}O_5$	=	$6CO_2$	+	$5H_2O$	—	120
Cane-sugar,	$C_6H_{12}O_6$	=	$6CO_2$	+	$6H_2O$	—	120
3. *Other Neutral Bodies**—							
Mannite,	$C_6H_{14}O_6$	=	$6CO_2$	+	$7H_2O$	—	130
Salicin,	$C_{13}H_{18}O_7$	=	$13CO_2$	+	$9H_2O$	—	280
Pectin,	$C_{32}H_{48}O_{32}$	=	$32CO_2$	+	$24H_2O$	—	560
Hæmatoxylin,	$C_{16}H_{14}O_6$	=	$16CO_2$	+	$7H_2O$	—	330
Elaterin,	$C_{20}H_{14}O_4$	=	$20CO_2$	+	$7H_2O$	—	430
4. *Oxygenated Volatile Oils, and Allied Acids*—							
Oil of Bitter Almonds,	C_7H_6O	=	$7CO_2$	+	$3H_2O$	—	160
Benzoic acid,	$C_7H_6O_2$	=	$7CO_2$	+	$3H_2O$	—	150
Oil of Cinnamon,	C_9H_8O	=	$9CO_2$	+	$4H_2O$	—	110
Cinnamic acid,	$C_9H_8O_2$	=	$9CO_2$	+	$4H_2O$	—	100
5. *Oily and Fatty Acids*—							
Acetic acid,	$C_2H_4O_2$	=	$2CO_2$	+	$2H_2O$	—	400
Butyric acid,	$C_4H_8O_2$	=	$4CO_2$	+	$4H_2O$	—	100
Valerianic acid,	$C_5H_{10}O_2$	=	$5CO_2$	+	$5H_2O$	—	130
Stearic acid,	$C_{18}H_{36}O_2$	=	$18CO_2$	+	$18H_2O$	—	520
6. *Resins and Camphors*—							
Many Resins,	$C_{20}H_{30}O_2$	=	$20CO_2$	+	$15H_2O$	—	530
Camphor,	$C_{10}H_{16}O$	=	$10CO_2$	+	$8H_2O$	—	270
Borneo Camphor,	$C_{10}H_{18}O$	=	$10CO_2$	+	$9H_2O$	—	280
7. *Carbo-hydrogens*—							
Oil of Lemons,	$C_{10}H_{16}$	=	$10CO_2$	+	$8H_2O$	—	280
Oil of Turpentine,	$C_{10}H_{16}$	=	$10CO_2$	+	$8H_2O$	—	280
Oil of Juniper,	$C_{10}H_{16}$	=	$10CO_2$	+	$8H_2O$	—	280
Cumene,	C_9H_{12}	=	$9CO_2$	+	$6H_2O$	—	240
Cymene,	$C_{10}H_{14}$	=	$10CO_2$	+	$7H_2O$	—	270

A glance at the composition of these seven groups shews that they present a series of deoxidations, till in the sixth, very little oxygen, and in the last, no oxygen whatever, is left. Thus, leaving out of view, for want of space, the compounds in which nitrogen and sulphur enter, 'oxalic acid is first formed, and then malic, tartaric, citric, &c. acids from it, or from each other; then sugar, starch, &c. from the acids; bitter, acrid, and coloured compounds from the sugar, starch, &c.; then oxygenated volatile oils; and then acids perhaps also from sugar, &c.; then the oily and fatty acids, either from the preceding oils and acids, or from sugar; then the resins from the fats, or from sugar; and lastly, the carbo-hydrogens. Thus, we have a picture of the whole process of vegetation as far as concerns compounds devoid of nitrogen and sulphur; and we find it uniformly to be one of deoxidation.'—Gregory, *op. cit.*, p. 548. To produce nitrogenous compounds, such as asparagine, amygdaline, nicotine, morphine, caffeine, &c., it is only additionally necessary that ammonia should be present, and the plant by a similar process gives rise to nitrogenous products, the process being shewn as below:

Asparagine, $C_4H_8N_2O_3 = 4CO_2 + H_2O + 2NH_3 - 60$
Amygdaline, $C_{20}H_{27}NO_{11}.3H_2O = 20CO_2 + 15H_2O + NH_3 - 410$
Nicotine, $C_{10}H_{14}N_2 = 10CO_2 + 4H_2O + 2NH_3 - 160$
Morphine, $C_{17}H_{19}NO_3 = 17CO_2 + 8H_2O + NH_3 - 390$
Caffeine, $C_8H_{10}N_4O_2 = 8CO_2 + 4NH_3 - (H_2O + 013)$

It is easy to shew how the sulphur contained in certain oils (oil of garlic, $C_6H_{10}S$, for example) is probably obtained by the reduction of the sulphuric acid existing in the sulphates of the soil; but the composition of the albuminates containing both sulphur and nitrogen is so complex that we cannot venture to attempt a popular explanation of the mode of formation of these matters from the simple food of plants.—On this subject the reader may

* In this group, which is very numerous, compounds of a most discordant character appear. Of the specimens we have selected, the first closely resembles a sugar; the second is a pure bitter; the third, a gelatinising substance · the fourth, a pigment; and the fifth, an acrid poison.

consult Liebig's *Agricultural Chemistry*, *Letters on Chemistry*, and *Laws of Husbandry;* Mulder's various works; Rochleder's *Phytochemie*, and the portion of Gregory's *Organic Chemistry*, and of the third volume of Gorup-Besanez's *Handbuch der Chemie*, devoted to this question, also Johnson's *How Plants Grow and how Plants Feed*, and Watts's *Dictionary of Chemistry.*

VEGETABLE IVORY. See IVORY, VEGETABLE.

VEGETABLE MARROW. See GOURD.

VEGETABLE PARCHMENT. See PARCHMENT, VEGETABLE.

VEGETABLE PHYSIOLOGY. All the most important departments of this subject have been already noticed in this work under the various headings of CIRCULATION OF SAP, FLOWER, FRUIT, LEAVES, METAMORPHOSIS OF ORGANS, PLANT, ROOT, SEED, SPORE, STEM, &c. We shall therefore here only discuss one subject, which has not been separately considered—namely, the organs and functions of reproduction in plants. Although, as we learn from Herodotus, the Babylonians knew that there were male and female date-trees, and that the female required the concurrence of the male to become fertile, and Theophrastus, in his work *On the History of Plants*, and other ancient authors, frequently mention the sexes of plants, Cæsalpinus, who died at Rome in 1603, seems to have been the first writer who directed his attention to the reproductive organs of plants; and he speaks vaguely of an emanation from the male causing fertility in the female; and Grew, in 1676, seems to have been the first who distinctly recognised the functions of the stamens and pistils. Ray, in his *Historia Plantarum*, 1694, adopted and enforced Grew's view; and Geoffroy, in 1711, read a Memoir before the Royal Academy supporting the same view. Linnæus, in his *Systema Naturæ* (1748), made these organs the foundation of his system of classification into sexual and non-sexual plants, the former being phanerogamous, or flowering, and the latter cryptogamous, or flowerless; in the latter division of plants, he could not detect stamens or pistils; and it was not till 1782, when Hedwig's work on Mosses was published, that anything was known with certainty regarding the sexual organs of any of the cryptogamia. From this brief notice of the early history of this subject, we proceed to the consideration of reproduction in the phanerogamous plants. A complete flower consists, as is well known, of four whorls (*verticils*), placed alternately within one another, the two internal being the *Stamens* (q. v.) and *Pistils* (q. v.), which are the essential organs of reproduction; while the two external are the *calyx* and *corolla*, which constitute the floral envelopes or protective coverings. Both the stamens and the pistils originate, like the floral envelopes (see FLOWER), from the thalamus, or upper part of the axis or peduncle, in the form of minute cellular processes; and in their development they resemble leaves, although, in their appearance, they are less like leaves than are the floral envelopes. These parts are well seen in the following diagram (fig. 1) of the flower of the vine, after it has cast its petals. There are here five stamens (the filament of one being concealed by the pistil), with introrse* two-lobed anthers. As separate articles are devoted to STAMENS and PISTILS, it is unnecessary to enter into any details regarding their anatomical structure. A few additional remarks on the pollen are, however, called for. This (the male fertilising agent) consists of cells contained in the anther case, and is discharged by various kinds of longitudinal, transverse, valvular, or porous dehiscence. When examined by the naked eye, it usually appears as a yellow powder; but when magnified, it is found to consist of cellules of different singular forms, varying in size from $\frac{1}{300}$th to $\frac{1}{700}$th of an inch in diameter. Oval, spherical, and triangular forms of pollen are shewn in figs. 2 to 6; and they may be square, cylindrical, hour-glass shaped, &c. These pollen-grains are developed in the large cells in the early stage of the anther. The contents of each cell divide first into two, and afterwards into four parts, each of which becomes covered with cellulose, so as to constitute independent cells or grains. These grains either burst through the parent cell, and become liberated, or they remain united in fours or some multiple of four, as in many species of acacia; or in large masses, such as those seen in Orchids and in Asclepias, when they constitute *pollinia.* Each pollen-grain has usually two coverings: the outer one, called *extine*, being a firm membrane, often marked with bands or rough points; and the inner one called *intine*, which is thin, and capable of extension. In the interior of the pollen-grains, a minute granular matter exists, called *fovilla*—the granules, which are mixed with starch and oil, varying from $\frac{1}{4000}$ to $\frac{1}{30000}$ of an inch in diameter. On moistening pollen-grains in water, they swell till the *intine* bursts at one or more points, and expels the fovilla. In the act of impregnation, the pollen is scattered on the pistil, and is moistened on one side by the fluid of the stigma (a part of the pistil composed of loose cells, which secrete a viscid fluid, and are uncovered by

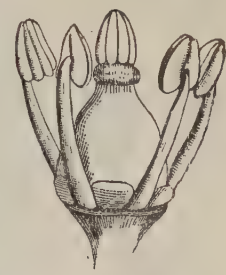


Fig. 1.

Andrœcium and Gymnœcium (or, in other words, the stamens and pistil) of the Vine, with the disc surrounding the base of the ovary.

Figs. 2 to 6.

Fig. 2.—Elliptical Pollen of Milkwort (*Polygala*), viewed lengthwise. Its surface, or extine, *e*, is marked with grooves or slits, *f*, where the intine protrudes. Fig. 3.—Ripe round Pollen of Cherry (*Cerasus*) discharging its fovilla through a tubular opening formed by the intine. There are two other points at which the intine is seen protruding. Fig. 4.—Triangular Pollen of Evening Primrose (*Œnothera*), with one pollen tube protruding. This tube is formed by the intine, which is also seen projecting at the other angles. Fig. 5.—Round ripe Pollen of Hollyhock (*Alcea*), with its extine covered with prominent points. Fig. 6.—Pollen of Fir (*Pinus*), in which, by the increase of the intine, the extine is separated into two hemispherical portions marked by the dark spaces at each end of the grains.

* This term is applied to anthers which open on the side next the pistil.

epidermis). It is then observed that the intine, instead of bursting, protrudes in the form of a tube called the *pollen-tube.* The number of these tubes varies greatly in different plants. According to Amici (as quoted by Balfour, to whose useful *Class-book* we are indebted for most of our facts and illustrations), the two pollinia (fig. 7) of *Orchis morio* contain each about 200 secondary small masses, composed of grains united in fours, and each of these small masses presents 300 openings capable of emitting tubes. In order that an embryo plant may be formed, the mature pollen must be discharged from the anther-cells of the stamen, and brought into contact with the stigma, through which, and then through the conducting tissue of the style, it must pass until it reaches the foramen, or micropyle, of the ovule. The means by which this contact is accomplished are various, such as elasticity and irritability of the stamens, the action of currents of air, and the intervention of insects passing from the male to the female plant. In the case of the orchids, fertilisation is solely effected by the agency of insects. The fertilising power of pollen is retained for a different length of time in different plants: thus, while in most species of Datura, and in *Lychnis dioica*, it loses its power in two days, in the wall-flower it remains efficacious for 14 days; while in the date, cannabis, tea, and camellia, it will keep fresh for a year; indeed, Micheaux mentions that the pollen of the date has been successfully used after 18 years! The quantity of pollen that is produced is much greater than is actually required for the impregnation of the ovules. Thus, in the Firs and Pines, the quantity is enormous, probably because of the obstacles here presented to fertilisation. The *sulphur showers* occurring in some districts are composed of the yellow pollen carried by the winds from pine-forests; and the showers of coloured rain which are occasionally noticed are due to a similar cause. The number of pollen-grains in certain flowers has been calculated. In a plant of *Cereus grandiflorus*, Morren observed that there were 40 flowers, each containing 500 stamens, and that each anther contained 500 pollen-grains; hence the entire number of pollen-grains in each flower was 250,000, and in the whole plant is 10,000,000. Similarly, in an entire Rhododendron plant, the pollen-grains amount to 72,620,000. The quantity required for fertilisation is very small—one, two, or at most three grains, being sufficient to impregnate one ovule. In most cases, the pollen of a single anther is sufficient for complete impregnation; the additional anthers being, as it were, added for the purpose of insuring the result. During the evolution of the stamens, and the maturation of the pollen, the pistil undergoes certain changes, of which the most important is that the stigma becomes enlarged, lax, and covered with a viscid secretion, which, besides detaining the pollen-grains, causes them to protrude their tubes, as already described; moreover, in some flowers, the style, which is sometimes covered with hairs, elongates during the discharge of the pollen, brushes the latter on to the pistil, and thus acts directly in fecundation. One of the central cells of the ovule now becomes much enlarged and developed, so as to form the embryo sac. At the end of this sac, next to the micropyle, several free nucleated cells are formed, to which the name of embryo vesicles, or germinal vesicles, has been given. In this way, the ovule is prepared for the action of the pollen, and for the production of the embryo plant. The tubes developed by the pollen-grains, when acted on by the secretion of the stigma, pierce the stigmatic tissue, and carry the fovilla through the canal of the style to the ovule, as shewn in the figures (8, 9, and 10). In some plants, the emission of tubes begins in half a minute after the pollen has been caught by the stigmatic secretion; in other cases, it does not begin for 24 hours or more; and it is said that in the larch, the tubes do not emerge for 35 days. The length to which the tubes extend is often very great, but the diameter is extremely small. In *Colchicum autumnale*, in which the style is 13 inches long, the length of the tube is 9000 times the diameter of the grain from which it proceeds. The time taken by the tube to traverse the length of the style varies, but does not always correspond with the

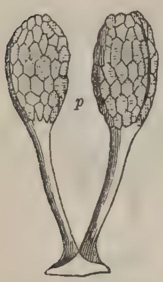


Fig. 7.
Pollinia, or Pollen-masses, of Orchis, separated from the point above the stigma, with their viscid matter adhering to them at the base. The pollen-masses, *p*, are supported on stalks.

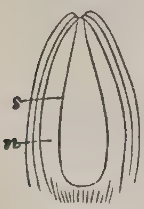


Fig. 8.
Ovule of Polygonum, shewing the embryo sac, *s*, developed in the midst of the nucleus, *n*.

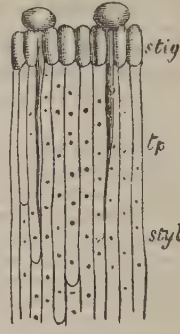


Fig. 9.
Vertical section of the upper part of the pistil of Frogsmouth (*Antirrhinum majus*). Two pollen grains are seen lying on the stigma, *stig*. These send out tubes, *tp*, which pierce the stigma, and penetrate the tissue of the style, *styl*, until they reach the ovules or young seeds.

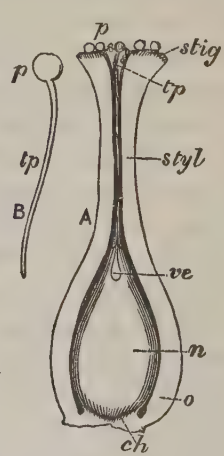


Fig. 10.
Pistil and Pollen of Polygonum. A, stigma, *stig*, with pollen grains, *p*, adherent to it, sending tubes, *tp*, down the conducting tissue of the style, *styl*; the ovary, *o*, containing the ovule with its covering and central cellular mass or nucleus, *n*, containing a rudimentary embryo-sac *ve*, in which ultimately the embryo is developed. The base of the ovule attached to the placenta, is marked by the chalaza, *ch*. B. pollen grain, *p*, separated, with pollen tube, *tp*.

latter. In some short-styled plants, the time is very long, while in the long-styled *Colchicum autumnale*, the pollen-tube reaches the ovule in about 12 hours. In some coniferous plants, a year is required for the process.

We now proceed to consider the embryogeny of (1) Gymnospermous and (2) Angiospermous Phanerogams. In the gymnospermous or naked-seeded flowering-plants, such as the coniferæ and cycadaceæ, impregnation is effected by direct contact between the pollen and the ovule, there being no true ovary bearing a stigma. The process is thus summarised by Balfour: "In gymnospermous plants, there are stamens containing pollen, and ovules supported on cones or altered branches, and in them the pollen enters the large micropyle of the ovule without the intervention of stigma or style. When the pollen reaches the nucleus of the naked ovule, it remains long dormant, and after many weeks and months, sends out a tube which reaches the embryo sac, and impregnates a corpuscle. One of the cells of the corpuscle then takes an active function, and develops the embryo with the suspensor in the midst of endospermal cells.'—*Op. cit.*, p. 600. In the angiospermous phanerogams, when the pollen-tube has traversed the tissue of the style, and reached the ovule, it proceeds through the foramen, or micropyle, so as to come in contact with the embryo sac; and consequent on this is the development of the cellular embryo. There is, however, much dispute as to what now occurs. 'Schleiden thinks that the end of the pollen-tube introverts the embryo sac, and in some cases perforates it, and that it becomes the first cell in the embryo. Most physiologists, however, agree in thinking that Schleiden was mistaken in regard to the extremity of the pollen-tube, and they believe that the embryo is formed from a distinct cell previously existing in the embryo sac. In some instances, the pollen-tube indents the embryo sac, at other times it perforates it, and comes into actual contact with a cell contained in the sac. In the embryo sac there are produced, before impregnation, certain cells, often three, which are called germinal vesicles, only one of which in general is impregnated by the pollinic fluid, which transudes through the membrane of the pollen-tube and the walls of the embryo sac and vesicles. After impregnation, the vesicle divides by a transverse septum into two parts, the upper portion forming a confervoid partitioned filament or suspensor, and the lower becomes filled with cells, constituting the rudimentary embryo. The suspensor is attached to the part which forms the radicle of the embryo, and at the opposite end, one or two cotyledons are produced, enclosing the fresh bud or plumule. An embryo is usually produced in each ovule (monembryonomy); but when more than one germinal vesicle is impregnated, there is a plurality of embryos (polyembryonomy). When the pollen of one species is applied to the pistil of another species, we occasionally find seeds produced which give rise to individuals intermediate between the two parents; these individuals are called hybrids or mules, and are rarely fertile. A plant has, however, a preference for the pollen of its own species, and hence hybrids are rare in nature.' —Balfour, *op. cit.*, p. 600. A reference to the preceding figure of a section of part of the ovule of a species of *Speedwell*, will elucidate the above summary: it shews the pollen tube *a*, just as it reaches the embryo sac which contains the rudimentary embryo *d*, attached to the sac by its suspensor *b*, and endospermal cells *c*, at the lower part of the sac. The suspensor is sometimes of considerable length, and as much as three, or even five times the length of the whole seed. Its attachment to the radicular end of the embryo is shewn in fig. 11. In monocotyledons, a single sheathing cotyledon is developed; in dicotyledons, two opposite leaves; and after their formation, the apex produces the terminal bud or plumule. The embryo is thus suspended in an inverted position in the seed.

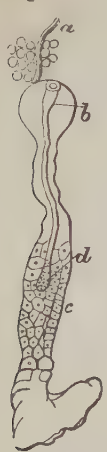


Fig. 11.

Section of part of the Ovule of a species of Speedwell (*Veronica triphyllos*), showing the pollen tube, *a*, passing through the cellular tissue of the nucleus, and reaching the embryo-sac, which contains the rudimentary embryo, *d*, attached to the sac by its suspensor, *b*, and endospermal cells, *c*, at the lower part of the sac.

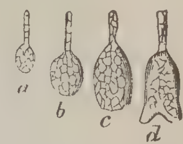


Fig. 12.

The embryo in different stages of development: *a*, Embryo in young state as a globular mass at the end of a suspensor. *b* and *c*, Embryo more advanced. *d*, Embryo shewing the division into two cotyledons.

It is impossible to enter into any general description of the organs or process of reproduction in cryptogamic plants. In this great division of the vegetable kingdom, the organs of reproduction are in general obscure, and consist usually of cellular sacs of two kinds—one being called *antheridia*, containing *phytozoa* or *spermatozoids*, representing the stamens, or the male; and the other being called *pistillidia* or *archegonia*, and representing the pistil, or the female. These structures, in a magnified state, are shewn in figs. 13 and 14, as they occur in the liverwort. In the fully developed

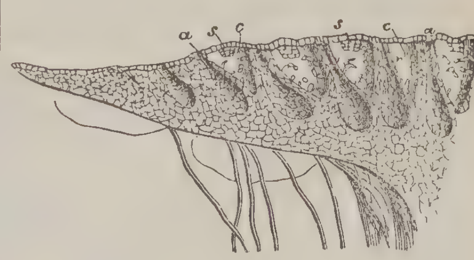
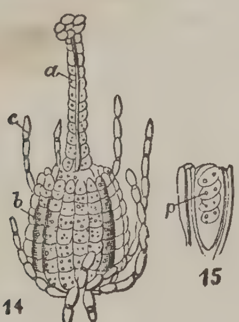


Fig. 13.

Vertical section of the disc-like receptacle of Liverwort (*Marchantia*), shewing the antheridia, *a a*, in its substance. These antheridia are flask-shaped sacs containing phytozoary cells. They communicate with the upper surface; and their contents are discharged through it. Between the antheridia there are air cavities, *c c*, connected with stomata, *s s*.

state of the plant, the antheridia disappear, while the pistillidia are transformed into cellular sacs containing germinating bodies known as Spores (q. v.), which are considered as being formed by a process of reproduction, and as being analogous to cellular embryos. These spores are developed in mother-cells, the contents of which often divide into four, such mother-cells being called sporidia. With regard to the antheridia and the pistillidia

in the different orders of cryptogamic plants, Dr Balfour observes that in ferns they are supposed to exist in a pro-thallus or cellular expansion produced by the spore when it germinates. A cell of the pistillium (the ovular body) afterwards gives rise to the spore-bearing leaves (the fronds). After impregnation, the archegonial cells give rise to a sporingiferous frond. The spores are contained in sporangia, with or without an elastic ring, developed on the back, on the side, or at the base of the leaves. In mosses, these organs are seen at certain stages of the plant's growth, and they are either on the same or on different plants. After impregnation, the archegonial cell gives rise to a stalked theca or sporangium with its spores. In liverworts, they are usually on different parts of the plant, and as frequently in the substance or on the under surface of disc-shaped cellular stalked expansions. Here the impregnated cell gives rise to the fruit or capsules. In lichens, the existence of these organs has not been already established; and the fructification consists of *thecæ* or *asci*, containing 4, 8, 12, or 16 sporidia (or cells containing spores) in their interior. (In fig. 15, a theca containing four sporidia is shewn.) These thecæ are usually



Figs. 14 and 15.

Fig. 14.—Pistillidium of Liverwort. It is a cellular body surrounded by an involucre, *b*, and separate filaments, *c*, and is provided with a styloid calyptra. Fig. 15.—A Theca of a Lichen, containing four nucleated cells. These cells ultimately form the sporidia or sacs containing numerous minute spores. Round the theca are cellular filaments, *p*.

united together so as to form a cup-like mass of fructification. When mature, the sporidia or thecæ burst, and discharge the spores. The fungi, antheridia, and pistillidia are obscure, and the organs of reproduction are spores which are either naked or are contained in thecæ. In algæ, antheridia and pistillidia have often been detected; but in some of them, certain cells, in the same or separate filaments, seem to possess the property of producing spores by a process of conjugation or union; and in the lowest forms the cells undergo division into new individuals.

Besides the above-noticed modes of propagation, cryptogamic plants are also propagated by buds or gemmæ, which are either attached to the leaves or fronds, or are contained in peculiar cup-shaped bodies.—For further information on the subject of this article, the reader is referred to Carpenter's *General and Comparative Anatomy*, and to Balfour's *Class-book of Botany*, from which we have borrowed freely in the composition of these pages.

VEGETABLE TISSUE, the term employed in Botany to denote the whole substance of which plants consist; regarded according to its structure, rather than to functions or chemical composition. The principal kinds are noticed in the articles CELLULAR TISSUE and VASCULAR TISSUE.

VEGETA'RIANISM, the doctrine that vegetable substances are the solids intended by nature for the sustenance of man, and that it is wrong—against nature and against good morals—for men to make use of an animal diet. There have never been wanting among speculative persons some who maintained that fruits and vegetables are the proper food for men; and illustrious names, such as those of Pythagoras, Plato, Plutarch, in ancient times—of Rousseau, Shelley, Swedenborg, in modern, can be counted among the upholders of this doctrine. A society for promoting the practice of vegetarianism was established at Manchester in 1847; and three years later, a similar society was established in the United States. Besides a short-lived publication called the *Vegetarian Advocate*, the vegetarians in this country for about a dozen years maintained a monthly journal, the *Vegetarian Messenger*, which was published at Manchester; but since 1861, they have been without an organ. The vegetarian creed has attracted very few disciples in England; and by these the advocacy of it has usually been conjoined with that of temperance, peace, homœopathy, and the cold-water cure.

There is, first, a physiological argument used in behalf of vegetarianism. It is said that the formation of the teeth and of the intestines in man proves that man was not intended to be a carnivorous, but a fruit and vegetable eating animal. Then it is maintained that a vegetable diet is the most favourable to man, in all respects, physical, intellectual, and moral; that with it, his life is longer, his enjoyment of life greater, his brain more vigorous, and his power of manual labour not less than with an animal diet; and that, while the use of animal food begets ferocious dispositions, a carelessness about life, a callousness to the sufferings of men or animals, a vegetable diet 'develops the gentler affections, and produces a broad and genial sense of brotherhood.' It is affirmed that animal food produces febrile and inflammatory tendencies; that, like alcohol, it is a stimulant (some vegetarians call it a stimulating poison); and that a mixed diet is open to all the objections which lie against moderate drinking. It is also alleged that animal food as exposed for sale is often tainted with some disease or unwholesome condition, and that it thus becomes a frequent cause of disease in men. Moreover, it is submitted that vegetables contain all the principles necessary for the sustenance of man; that, therefore, the use of flesh is unnecessary; and that this being so, it is selfish, cruel, and tyrannical—calculated, too, to increase selfishness, cruelty, and tyranny in men—to cut short the existence of inferior animals.

The opinion of physiologists is not favourable to vegetarianism. The structure of man's organs is held to prove that nature intended him for an omnivorous animal, his stomach and intestines being fitted for deriving nourishment from every kind of food, and he being able, by means of cooking, to modify his food so as to prepare it for mastication and digestion. There is also almost a concurrence of medical experience against vegetarianism, and in favour of the opinion that man, as regards all his powers and faculties, thrives best, and that—if a difference can be made out—he also lives longest upon a mixed diet. It has been found, in making railways, that differences between workmen in respect of bodily strength and energy were chiefly due to a difference of diet; that, for example, a beef-eating Englishman would almost do the work of three vegetable-fed Frenchmen, and that this difference of working-power disappeared when the Frenchmen took to eating

beef. Upon the alleged beneficent moral influence of vegetable food, it may be observed that there is no proof whatever of its reality; moreover, that since the majority of mankind live either mostly or entirely upon vegetables, vegetables must bear a large share of the responsibility which may fall upon diet for the evil tendencies of man; and that, in fact, the most cruel and the most debased of human races live entirely upon vegetables. To the charge of cruelty brought against the practice of killing animals for food, it has been answered, that the plan of nature contemplates such cruelty—if cruelty it be—and makes it impossible to avoid it; that the microscope has shewn us that even in taking a draught of water we may deprive a multitude of beings of life; and that, on the other hand, the system of rearing cattle for the butcher—since the cattle would otherwise not be reared at all—really adds very largely to the sun of happy animal existence. It is not disputed that there is a liability to disease from the use of unwholesome meat; but, then, vegetables as well as animals are subject to diseases; and the reasoning which would drive us from the use of animal food because it may be diseased, would really cut us off from food altogether.

VEHMGERICHTE. See FEMGERICHTE.

VE'II, an ancient city of Etruria, in early times the formidable rival of Rome. Its very site is disputed, but is now generally thought to be at *Isola Farnese*, about 12 miles from Rome. The struggle between the two cities is recorded by Roman historians to have commenced as early as the time of Romulus, and to have continued under each of the kings, except the pacific Numa, and always to the advantage of the Romans. The Veientines had their revenge so far under Porsenna; but after his time, being convinced by repeated defeats that they were no match for their enemy in the open field, they had recourse to the plan of sheltering themselves behind their walls on the approach of the Roman legions, and of sallying out on predatory expeditions as soon as they had retired. To relieve the republic from this annoyance, the Fabian clan, to the number of 306, with their followers, probably ten times as numerous, undertook to garrison a fortress near Veii, and act as a guard against the marauders. They were, however, enticed into an ambuscade, and cut off to a man at the Cremera. For the next 60 years, hostilities often broke out, followed by ill-observed truces. At last, the Romans determined to rid themselves of their rival by a siege, and persevered with great tenacity, though the city held out for ten years, and repeated attempts were made by neighbouring states to relieve it. It is said to have been taken at last by a mine, which was directed so as to lead into the citadel. The citizens were massacred or sold as slaves, and the land confiscated. The fall of Veii took place 396 B.C. It was debated more than once, especially after the destruction of Rome by the Gauls, whether Rome should not be abandoned, and Veii made the capital. After its fall, it was gradually deserted; and although, in later times, a colony was planted there by Cæsar, and again by Augustus, it always remained an insignificant place. There are remains of the Etrurian, and also of the Roman city, which have latterly been traced out and described.

VEIL. This familiar article of dress is one of the most ancient in use; its origin is lost in remoteness, but we find an allusion to the wearing of veils by the Chinese in Ovid, and Juvenal speaks of women as being so delicate as to be overheated by a silken veil. Although generally considered portions of female dress, we read in the works of Ambrose (374 A.D.), of 'silken garments and veils interwoven with gold, with which the body of the rich man is encompassed.' Its use is now so extended that it may be found in every part of the civilised world, but almost exclusively confined to women.

VEINS, in Anatomy, if we except the pulmonary, the portal, and the umbilical veins, are the vessels which carry back venous blood from the capillaries, and enlarging as they proceed finally pour it through the ascending and descending *venæ cavæ* into the right auricle of the heart. See CIRCULATION. Their coats are similar to those of the arteries, but much thinner, and even transparent. They are, however, of considerable strength. The *internal coat* consists of an epithelial layer, supported on several laminæ of longitudinal elastic fibres. The *middle* or *contractile coat* consists of numerous alternating layers of muscular and elastic fibres; the muscular fibres being disposed circularly round the vessel. The muscular fibres are wanting in some parts of the venous system, and specially developed in others (as, for example, the splenic and portal veins, where, perhaps from the physical character of the tissues which they pervade, there may be more than the ordinary resistance to the passage of the blood). In the *venæ cavæ* and pulmonary veins near the heart, striped muscular fibres may be detected, continuous with those in the auricles. The *external* or *areolar fibrous coat* consists of connective or areolar tissue, and of longitudinal elastic fibres; within some of the larger veins, as the inferior *vena cava*, through its whole length, the external iliacs, the azygos, &c., there is also a longitudinal network of unstriped muscular fibres. The existence of valves in the veins is mentioned in the article CIRCULATION. These valves are most numerous in the veins of the extremities, especially the lower ones, these vessels having to act against the force of gravity more than most others. They are absent in the *venæ cavæ*, the hepatic, portal, renal, pulmonary, and some other large veins, and in very small veins generally. The veins are nourished by nutrient vessels, or *vasa vasorum*, like the arteries; but except in a few instances (including the inferior *vena cava*), nerves are not distributed to them.

The chief diseases of the venous system have been already sufficiently described in the articles PHLEBITIS, OR INFLAMMATION OF THE VEINS; PHLEBOLITES; PHLEGMASIA ALBA DOLENS, OR MILK-LEG; THROMBUS; and VARICOSE VEINS. We shall here merely refer to two conditions of the venous system which must be regarded as the results of natural rather than morbid action: they are *Hypertrophy* and *Atrophy*. Hypertrophy is a natural and healthy change, which will be readily understood by one or two illustrations. When the uterus enlarges during pregnancy, the quantity of blood in it increases in at least a corresponding ratio, and so also do the venous canals by which it is removed; while, shortly after delivery, they return to their natural size; the hypertrophy being accompanied with a proportionate dilatation. This form of hypertrophy, with dilatation, often exerts a compensative action, one vein, or set of veins, taking additional work (and consequently requiring an increase of calibre), to make up for the partial or entire occlusion of another. When, for example, the ascending vena cava is diminished in size, or even entirely and permanently closed, it is well known that the lower portion of the vessel dilates in common with the branches entering into it, and that the superficial abdominal veins or azygos, or both, become enlarged, and thus carry to the heart

the blood which ought to have reached the heart by the usual course. If the obstruction is only temporary, the enlarged veins return to their original state, except that additional transverse fibres are found in the middle coat. Atrophy of the veins accompanies the corresponding changes of other tissues, when a part is permanently diseased. Amputation above the knee soon reduces the femoral vein to less than one-third of its previous size. Mr Callender, in his article on 'Diseases of the Veins,' in Holmes's *System of Surgery*, states that in the case in which a kidney became transformed into a large cyst, the canal of the renal vein was impervious to a common probe; and this condition is daily seen in the change which occurs in the umbilical vein shortly after birth.

VEINS, in Geology, are crevices, more or less vertical, caused by the contraction during drying or metamorphoses, or by the mechanical disturbance of a rock, which have been filled by materials different from the body of the rock. Veins containing substances that have been injected in a state of fusion from heat, have had their origin in some internal force; while those filled with mineral deposits may or may not be connected with upheaval. Granitic and trappean veins differ from dykes chiefly in the greater size of the latter. They produce similar changes in the rocks which they penetrate, indurating clays and sandstones, and converting limestones into marble, or giving them a compact texture like hornstone. Granite veins are generally more sinuous in their course than those of trap. One set of veins often intersects another, having been produced at a later period; and the two sets generally differ in colour, grain, and even mineral composition. Granite generally assumes a finer grain, and is even different in composition in the veins it sends into the adjoining rocks. Mineral veins are filled with different kinds of crystalline minerals. Quartz and calcite are the most common of these substances; but frequently several different minerals occur in the same vein, some of these being metallic ores. Veins of the same age are filled with the same metals, and generally maintain a general parallelism of direction. Thus, the tin and copper veins of Cornwall run nearly east and west; while the lead veins run north and south. Three kinds of veins are distinguished by the miners—Rake, Pipe, and Flat veins. The rake veins are simple crevices, crossing all the rocks of a series, generally highly inclined, and apparently formed from the contraction of the rock. The two originally opposite surfaces may retain their relative positions, only separated by the interposed contents of the veins; or a fault may place the originally contiguous surfaces at different levels; and in such a case, the intervening space between the walls of the vein are irregular, sometimes narrowing so that the walls are in contact, and then widening out, and forming large cavities containing ores. The pipe veins are irregular cavities, filled with minerals, and without any apparent connection with faults in the strata. Flat veins have a general direction corresponding with that of the stratification, and are connected sometimes with rake veins, and sometimes with pipe veins. The manner of working the minerals contained in veins is explained in the article MINING (q. v.).

VEIT, PHILIPP, a distinguished German painter, was born at Berlin, February 13, 1793. His mother, a daughter of Moses Mendelssohn, had for her second husband, Friedrich Schlegel, and V. became devotedly attached to the religious and artistic ideas of his stepfather, whom he followed in his renunciation of Protestantism for Roman Catholicism. After finishing his studies at Dresden, he proceeded to Rome in 1815, and became a prominent member of that coterie of young German painters who sought to infuse into modern art the purity and earnestness of medieval times. Of all the associates, V. ventured furthest into the obscure realms of symbolism and allegory. His first famous work was the 'Seven Years of Plenty,' executed as a companion-piece to Overbeck's 'Seven Years of Dearth,' and forming part of a series of frescoes illustrative of the history of Joseph, painted at the Villa Bartholdy in Rome. In richness and freshness of invention, it is reckoned one of the best works of the school to which it belongs. Other pictures of a high order of merit, done during his residence at Rome, are 'The Triumph of Religion' (Vatican Gallery), 'Scenes from Dante's *Paradiso*' (Massimi Villa), and an altar-piece, representing 'Mary as Queen of Heaven' in the Trinità de' Monti. These procured him so great a reputation that he was called to the Directorship of the Städelsche Art Institute, in Frankfurt-on-the-Maine. While holding this position, he produced many grand pictures, of which the most celebrated is the large fresco (at the Institute), representing 'Christianity bringing the Fine Arts to Germany,' held by many to be the finest fresco by any modern artist. Others are, 'The Two Maries at the Sepulchre,' and 'St George.' In 1843, he resigned his post as director, and removed his atelier to Sachsenhausen, in Hesse-Cassel, where he resided till his death in 1854. The most important of his later works are, 'The Ascension of the Virgin' (Frankfurt Cathedral), 'The Parable of the Good Samaritan,' 'The Egyptian Darkness,' and 'Glorification of the Christian Faith in its Alliance with the Reigning House of Prussia,' for the king of Prussia.

VELASQUEZ, DIEGO RODRIGUEZ DE SILVA, one of the most famous of Spanish painters, was born at Seville, in June 1599, of a family of Portuguese origin. Very early, the bent of nature became obvious in him; and he was sent to be educated in the studio of Francisco Herrera el Viejo, an artist of considerable force and originality. He afterwards became the pupil of Francisco Pacheco, a man accomplished in theory, but who could practically teach him little. The old pedant had, however, an attractive daughter, named Juana, who, doubtless, to the eyes of the young painter, atoned for her parent's deficiencies, and who married him at the end of five years. His chief education, however, as with all men of real genius, was that which he gave himself; he painted assiduously from the life; the models he selected were, for the most part, of the sordid peasant class, and in this way a certain habit of mind was induced, unfavourable to the attainment of that pure and elevated ideal, some infusion of which is all that is wanted to elevate the noble realistic hardihood of his manner into the very highest region of the art. In 1622, he paid a visit to Madrid, to study the treasures of art there accumulated. During his stay, he painted the portrait of the poet Gongora, and made some influential friends, at whose instance he was, the year after, invited to return by the Conde Duque de Olivarez, the favourite of Philip IV. His portrait of this magnate so delighted the king, that he himself sat to the artist, and the result was a picture of superb merit, by the public exhibition of which the artist at once became famous. The office of court-painter was bestowed upon him, and he found himself at once embarked on a full tide of the prosperity which continued through life to flow upon him. Of Philip IV. and his family he painted many pictures; and shortly after his appointment, he executed a portrait—unfortunately

lost—of the English Charles I., then (1623) at Madrid on his famous fool's errand. The year 1628 was made memorable to him by the arrival, in Madrid, of the great Rubens, on a diplomatic mission. The two artists were worthy to become friends, and speedily became so; but though Rubens, during his stay, was assiduous in the practice of his art, the familiarity of V. with his florid harmonies of colour and riot of animal vigour seems to have exercised no modifying influence on the restrained gravity and severity of his own style, now thoroughly matured.

V. had long desired to visit Italy; and in 1629, permission was granted him to proceed thither. Everywhere he was received with the highest honours; and in Rome, in particular, Pope Urban VIII. assigned him apartments in the Vatican. Here he chiefly employed himself in copying the frescoes of Raphael and Michael Angelo; and it is remarkable that, in the one or two original pictures which he at this time produced, no hint of an influence can be traced from his studies of these mighty masters. He was not the less profoundly sensible of their power; though he has left it on express record, that of all the Italians he considered Titian the greatest. Such, however, was his powerful individuality, that, his own style once formed, no such external influence was able to affect it appreciably. Having recovered from a severe illness, he proceeded to Naples; and finally, in the spring of 1631, returned to Madrid, where he was cordially welcomed by his royal patron, with whom he now became more and more a favourite. He had a painting-room in the palace assigned him; and the king was wont to come familiarly to watch him at work. It is a noble trait in the man, which deserves to be recorded along with his triumphs as an artist, that when, in 1643, the Duque de Olivarez, to whom he had been indebted whilst yet obscure, incurred disgrace at the hands of Philip, he braved the royal displeasure, by continuing to shew him in everything the respect to which he had been accustomed. In 1648, V. proceeded again to Italy, on a mission from the king to buy pictures and other works of art. He returned to Madrid in 1651; after which time many of his finest works were painted. Such was the favour in which he continued to be held by Philip, that, in 1656, the Cross of Santiago was conferred on him, an honour never before awarded except to the highest of the nobility; and shortly after, he was appointed Aposentador Mayor. This post, the duties of which consisted in attendance on the king in his journeys, and superintendence of everything essential to his convenience, was one of much honour and emolument; but it involved at times great trouble and anxiety; and on the specially important occasion of the conferences held, in 1660, to arrange the marriage between Louis XIV. and the Infanta, these were such as to utterly prostrate the painter. On July 31 of that year, he returned to Madrid, worn down with the overwork to which he had been forced to subject himself, and died in a week after, on the 7th August. He was buried with much ceremonial in the church of San Juan. His wife, who was passionately attached to him, only survived his loss about a fortnight.

V.—with the doubtful exception of Murillo—takes admitted rank as the greatest of Spanish painters. His portraits are, for force, penetration, directness, and severity of truth, of almost unrivalled merit; his historical pictures are also of rare value; his landscape effects are full of air and light; and his treatment of religious subjects only fails in defect of that deeper spirituality, the expression of which has been in its fulness attained by none save a few of the earlier Italians. The works of V. are in England rare. The two or three specimens to be found in the British National Gallery very inadequately represent his genius, of the power and variety of which a worthy conception is only to be formed at Madrid, where his finest works are preserved.

VELEZ-MALAGA, a town in the south of Spain, in the modern province of Malaga, and 16 miles east of the city of that name. It stands at the foot of a hill which forms part of the south range of the Sierra Tejada, and rises with its fortress and its spires overlooking the river Velez, at a distance of less than two miles from the shore of the Mediterranean. The climate, said by the Andalusians to be 'that of heaven,' is delightful; and owing to the abundance of moisture supplied by the hill-streams from the north, and the heat of an almost tropical sun, the vegetation of the vicinity is of the most luxuriant description. The aloe, palm, sugar-cane, prickly pear, orange, vine, olive, indigo, and sweet potato (*Batata de Malaga*), grow here abundantly. There are here the ruins of a Moorish castle, with a small tower. The town was taken from the Moors by Ferdinand the Catholic, after a long siege. Pop. 15,000.

VELIKI-LOUKI, a town of Great Russia, in the government of Pskov, on the river Lovat, 130 miles north-west of Smolensk. It is one of the most ancient towns of Russia, having belonged to Novgorod before the annexation of that territory to Moscow. Boots are largely manufactured, and exported to St Petersburg. Pop. 4797.

VELIKI-USTIUG, a trading-town of Great Russia, in the government of Vologda, at the confluence of the Jug and the Suchona, 350 miles south-east of Archangel. It was founded in the 13th c. by a colony from Novgorod. Among the branches of industry are the manufacture of small iron-ware and of linen. Pop. 7756.

VELINO, Cataract of. See Terni.

VELLE'IA, or **VELEIA**, a town of ancient Liguria, situated among the northern slopes of the Apennines, 18 miles south-by-east of Placentia (Piacenza). Little information respecting it can be gleaned from the Latin writers. The Veleiates are mentioned by Pliny among the Ligurian tribes, and seem to have been subjected to Rome in 158 B.C. The town, however, dates from the time of Tiberius, and appears, according to the traditionary account, to have been overwhelmed by a land-slip of the mountains Moria and Rovinazzo, the earth having been loosened by the percolation through it of the waters from a lake high up in the mountains. A comparison of the soil which covers the city with that of the mountains, confirms this story, though, strange to say, there is not the slightest notice in Roman history of such an event having happened. V. remained hid and forgotten till 1747, when a field-labourer turned up a tablet of bronze, on which Trajan's alimentary law for the public maintenance of 279 children was written. This tablet, which measured about 8 feet 8 inches by 5 feet 9 inches, Paris measurement, and weighed 7200 ounces, narrowly escaped being melted down for bell-metal; and in 1760, excavations were commenced by the directions of the Duke of Parma at the place where the tablet had been found. The result of these investigations, which were continued till 1765, was the discovery of a forum, in which was another bronze tablet of a smaller size than the one previously found, an amphitheatre, baths, 12 marble statues, numerous small bronze statues, medals, coins, stamps, inscriptions, and bronze instruments of various kinds. From none of the coins discovered

being of later date than the time of Probus, it has been supposed that the catastrophe which overwhelmed the city happened either during or soon after his reign. The museum at Parma contains most of the antiquities which have thus been rescued from the bowels of the earth.

For about a century previous to 1747, it was known to a very few that ancient treasures were concealed at the place where the town was subsequently discovered; and so much wealth in coins and gold statues was discovered by a poor priest belonging to the adjoining village of Macinisso, that his family became ennobled.

A few trifling excavations have been made since 1765, but they have now been discontinued for a number of years.—See *La Rovina di Veleia, misurate e disegnate da Giovanni Antolini*, &c. (Milano, 1819); and *Tavola Legislativa della Gallia Cisalpina ritrovata in Veleia, da D. Pietro di Lama* (Parma, 1820).

VELLE'TRI, a city of Southern Italy, in the Pontifical States, is walled, well built, and situated on a hill, 21 miles south-east of Rome. The principal buildings are the cathedral, an ancient Gothic structure; and the Ginetti Palace, with a marble staircase, esteemed the finest in Italy. The hill of Velletri, which, like all the country between it and Rome, exhibits evidences of volcanic action, produces good wines. Pop. 12,500.

VELLORE, India. See SUPPLEMENT in Vol. X.

VELLO'ZIA, a genus of plants of the natural order *Hæmodoraceæ*, natives of Brazil, Southern Guiana, and the Mascarene Islands. They are sometimes called *Tree Lilies*. They are perennials, with trunks closely covered by the withered remains of leaves, branching by forks, and bearing tufts of long, narrow, aloe-like leaves at the extremities of the branches. Some of them are from two to ten feet high, and the trunk is sometimes as thick as a man's body. The structure of the trunk is very remarkable. It has a slender sub-cylindrical central column, of the ordinary monocotyledonous structure, outside of which are arranged great quantities of slender fibrous roots, which cohere firmly by their own cellular surface, and form a spurious kind of wood. In some of the southern districts of Brazil, vellozias are found covering large tracts. The flowers of the larger species are about six inches long, either pure white, or of a beautiful purple colour, much resembling the white lily of our gardens.

VELLUM. See PARCHMENT.

VELO'CITY (Lat. *velox*, swift) is the common term employed to denote speed, or *rate of motion.* It is obviously greater the greater the space passed over in a given time. But, for its accurate measurement, we must distinguish between uniform and varying velocity.

Nothing is easier than the measurement of uniform velocity. It is measured by *the space passed over in a unit of time.* Thus, we speak of velocities of 10 feet per second, 20 miles per hour, &c. But, for scientific purposes, it is best to keep, as far as possible, to definite units of time and space; and those most generally convenient are the *second* and the *foot.* The latter is defined, from the imperial yard, by act of parliament; the former is usually chosen as the interval between the beats of a good mean-time clock. Unfortunately, its duration is not invariable; but, as ages must elapse before any sensible alteration takes place in its length, it may be used without inconvenience. If, then, v be the velocity of a point moving uniformly, we mean that v feet are passed over in each second; so that, if s represent the space passed over in t seconds we have

$$s = vt,$$

a formula which contains the whole properties of uniform motion. It gives

$$v = \frac{s}{t};$$

that is, to find the velocity of a moving point (when uniform), divide the space (in feet) described in *any* period of time by the number of seconds in the period. This will give the same result whether we take a million seconds or the millionth part of a second, as the period in question. This at once shews us how to proceed in measuring a variable velocity, such as that of a stone let fall, in which case the velocity constantly increases, or of a stone thrown upwards, in which case the velocity constantly diminishes.

That a moving body has, at every instant, however irregular its motion may be, a definite velocity, is obvious, and is, in fact, matter of every-day remark. Thus, when travelling in a railway train, we say, shortly after starting: 'We are now going at the rate of a mile an hour;' not thereby meaning that it will take us an hour to complete the mile, but that, *if we were to go on for an hour with the velocity we now have, we should run a mile.* Again, we may say: 'Now we are going at 30 miles an hour;' not thereby meaning that we have so much as 30 miles to travel, or that our journey is to last more than perhaps a few minutes, but that *an hour at the present rate would take us* 30 *miles.* In common language, then, our question is, how to measure our present rate.

If we could at any instant so adjust the steam-power to the resistance of the air and the friction of the rails as to keep the rate unaltered, we should have uniform velocity, measurable with ease, as above shewn. But, as we cannot generally do this (though Attwood's machine enables us to do it in the case of a falling body), we are driven to some other expedient. Now, it is obvious that the smaller the interval we take, the less will our velocity have changed during its lapse, i. e., the more nearly will it have become uniform and measurable by the simple formula given above. That is for a variable velocity we have

$$v = \frac{s}{t}$$

as an approximation, which is more and more nearly true as t, and therefore s, is smaller. In the language of the differential calculus—whose fundamental notions, as laid down by its great inventor, were, in fact, derived from this very question, the velocity being simply the *Fluxion* (q. v.) of the space described—we have

$$v = \frac{ds}{dt}.$$

Practically, by means of the electric chronoscope, we can now measure (very exactly) extremely small intervals of time, such, for instance, as the interval between the fall of the dog-head and the exit of the bullet from a rifle-barrel; so that a variable velocity now presents no formidable difficulty, as we can study and measure it *while it is almost absolutely uniform.*

We define *average* velocity as the space described in any time divided by the number of seconds employed. This may not, except at one or more instants during the motion, represent the actual velocity; but it is a velocity with which, if uniform the same space would have been described in the same time. We shall presently have an opportunity of usefully applying this definition to one interesting case of varying velocity.

The *resolution* and *composition* of simultaneous velocities follow, almost intuitively, from the most elementary geometrical notions. When a man is walking north-east at a uniform rate, it is obvious to common-sense that he is progressing northwards, and also eastwards. What is his northward, and what his eastward velocity? The answer is very simple. Suppose that in one second he walks from A to B, then AB represents his whole velocity. But draw AN northwards, and AE eastwards; also draw BC parallel to AN. Then AC is the space by which B is eastward of A, BC the space by which it is northward. Hence AC represents the eastward, and CB the northward velocity (each being the space in its respective direction described in one second), and these are called *components* of the velocity AB. AB, again, is said to be *resolved* into AC and CB.

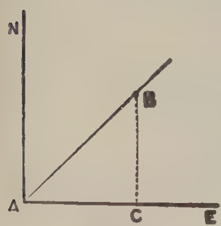


Fig. 1.

The general proposition is this, that a velocity represented by one side of a triangle may be resolved into two, represented in magnitude and direction by the other sides of the triangle. One or both of these may be again resolved by a similar process; and we find, as the most general propositions on the subject, that velocities represented by all the sides of a polygon (whether in one plane or not) but one, taken in the same order round, are jointly equivalent to a velocity represented by that one side, taken in the *opposite* order; also that a point which has, simultaneously, velocities represented by the successive sides of any polygon, taken all in the same order round, *is at rest.* The second law of motion (see MOTION, LAWS OF) enables us to interpret this geometrical theorem into the Physical Truths known as the Triangle and Polygon of Forces in Statics.

Rate of change of velocity is called *Acceleration.* It is measured in the same way as velocity itself. Thus, if the change take place in the direction of motion, it affects merely the amount, not the direction, of the velocity; and an acceleration α adds (or subtracts, if it be negative) α feet per second from the velocity affected. Thus it is found that gravity produces an acceleration of about 32·2 on all falling bodies; so that if a stone be let fall, its velocity after t seconds is $32{\cdot}2t$. If it be *thrown* down with a velocity v, its velocity in t seconds is $v + 32{\cdot}2t$. If thrown upwards with the same velocity, in t seconds its velocity becomes $v - 32{\cdot}2t$, so that it will stop and begin to descend after $\frac{v}{32{\cdot}2}$ seconds have elapsed.

The space passed over by the stone in t seconds is easily calculated by the help of the *average* velocity. For, since in any of the above cases the velocity increases (or diminishes) *uniformly*, its average value during any interval is the average of its values at the beginning and end of the interval. Hence, for the stone simply let fall:

Initial velocity $= 0$,

Velocity after t seconds $= 32{\cdot}2t$,

Average velocity during the first t seconds $= 16{\cdot}1t$.

Hence, space described in t seconds

$$= t \times \text{average velocity} = 16{\cdot}1t^2.$$

So that the spaces described are as the *squares* of the times.

But, if the acceleration be not in the direction of motion, the direction as well as the magnitude of the velocity will generally change. To exhibit this geometrically, Hamilton (q. v.) invented the following beautiful construction of what he called the Hodograph of the motion. Let O be any fixed point, and from it draw lines OP, OQ, &c., representing, at every instant, in direction and magnitude the velocity of the moving point. The extremities of such lines will form a curve, such as PQ in the figure. If OP and OQ be any two of these, the *change* of velocity is represented (as above) by the third side, PQ, of the triangle. As Q is taken nearer and nearer to P, PQ becomes more and more nearly the tangent to the hodograph, so that the tangent at P has the *direction* of the acceleration, and the rate at which P moves round the hodograph is the *magnitude* of the acceleration.

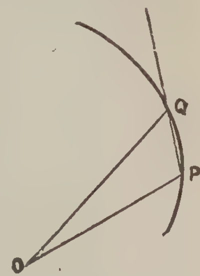


Fig. 2.

If we consider any uniform motion, we see that the hodograph is a circle (its radius being the magnitude of the velocity), and from this it is easy to see that *in uniform motion the acceleration is always perpendicular to the direction of motion.* If we consider uniform motion, with velocity V, in a circle of radius R, the hodograph at once shews that the acceleration is $\frac{V^2}{R}$, and is directed towards the centre of the circle.

Translated into Physics, acceleration (multiplied by the mass of the moving body) is the measure of the force which acts on the body. So the above simple example shews that, to keep a mass moving uniformly in a circle, it must be drawn towards the centre by a force proportional directly to the square of the velocity, and inversely to the radius. This is the physical explanation of the so-called Centrifugal Force (see CENTRAL FORCES).

VELOCITY, INITIAL, in Gunnery, is the speed with which the ball leaves the muzzle of the gun. This was formerly calculated from the momentum, as shewn by the Ballistic Pendulum (q. v.). A great improvement of the last ten years is the Electro-ballistic Pendulum, the invention of a Major Navez of the Belgian service, which actually measures the interval of time during which the shot traverses a short space of ground. The apparatus consists of a steel pendulum falling at the side of a graduated sector of a circle. Behind the segment is a piece of iron capable of being magnetised by a galvanic battery adjoining. The wires for completing the circuit between the battery and the magnet are so arranged that they are in connection with two targets of paper or other thin material in the line of the projectile's fire. So long as the circuit is complete, and before the experiment, the magnet holds the pendulum at its highest point. When the shot pierces the first target, the circuit is broken, the iron demagnetised, and the pendulum released; these effects being absolutely simultaneous. With equal simultaneity, the piercing the second target re-establishes the circuit, magnetises the iron, and arrests the pendulum in its descent. The distance between the targets is known, and the accumulating resistance of the atmosphere within that time; the sector being finely graduated, the distance traversed by the pendulum shews exactly the fraction of a second occupied, and from these data the initial velocity is a matter of simple computation. Of an ordinary smooth-bore cannon, the initial velocity is about 1600 feet per second.

VELOCITY, VIRTUAL. See WORK.

VE'LVET, a fabric in which, beside the ordinary

warp and weft, which are usually arranged as in plain-weaving, there is also a supplementary weft, consisting of short pieces of silk, cotton, or woollen thread doubled under the regular weft, and brought to the surface in loops which are so close together as to conceal the regular web. The loops are afterwards cut evenly, and the ends thus made constitute a covering resembling a very short fur. In silk velvets, the warp and pile threads are both of organzine silk, which is the strongest used in weaving.

VE'NDACE (*Coregonus Willughbii* or *marænula:* see COREGONUS), a fish of the family *Salmonidæ*, found in the rivers and lakes of Sweden, in the Castle Loch at Lochmaben in Scotland, and in some of the English lakes. It is popularly said to have been introduced at Lochmaben by Queen Mary; but the statement rests on no authority, and is highly improbable, as the fish could not be easily transported, except by the roe, living only for a very short time after being taken out of the water. Like most of its congeners, it is highly esteemed for the table. Its food consists chiefly of *Entomostraca*, and it is never taken by angling.

Vendace (*Coregonus marænula*).

Sweep-nets are used for its capture. It generally swims in considerable shoals, often with a remarkable separation of the sexes. It attains a length of 6 or 7 inches, is deeper in proportion than many of the Salmonidæ, and of a compressed form. The outline rises quickly from the snout to the dorsal fin, and the body tapers rather suddenly at the tail. The under-jaw projects a little. The scales are of moderate size, and do not come off very readily. The tail is broadly forked. The back is brown, the sides tinged with yellow, the cheeks partly white, and there is a curious, red, heart-shaped mark between the eyes. It spawns in November and December, and multiplies rapidly, notwithstanding the presence of predaceous fishes in the waters which it inhabits. V.-fishing at Lochmaben takes place only on the 1st of August each year. The V. might probably be introduced with advantage into many of the British lakes. It is doubtful if this fish is the same with the *Coregonus albulus*, found in Pomerania.

VENDÉE, LA, a maritime dep. in the west of France, bounded on the W. by the Bay of Biscay, on the N. by the dep. of Loire-Inférieure, and on the S. by that of Charente-Inférieure. Area, 2587 sq. m.; pop. (1881) 421,642. The dep., which owes its name to a small affluent of the Charente, is traversed from east to west by a range of hills, called in the east the Plateau de Gatin, and in the west the Collines Nantaises; and is watered in the north by the affluents of the Loire, and in the south by the Lay and the affluents of the Charente. The territory of La V. is divided into three parts, the names of which indicate the character of their configuration. In the west is the *Marais*, occupied by salt marshes and lakes; in the north is the *Bocage*, covered with plantations; in the south and middle is the *Plaine*, an open and fertile tract. The coast-line, 93 miles in length, presents few deep indentations, the chief being the Bay of Aiguillon, which affords secure anchorage for vessels. The climate is warm, humid, and unhealthy in the *Marais*, cold and humid in the *Bocage*, and warm, dry, and healthy in the *Plaine*. Cereals, potatoes, and vegetables are largely cultivated; the wine produced, which is white and of inferior quality, amounts to 5,500,000 gallons a year. Among the mineral treasures, iron ore is very abundant. There are three arrondissements—Napoléon-Vendée, Fontenay-le-Comte, and Sables-d'Olonne. The capital is Napoléon-Vendée.—For the *wars of La V.* (by which name the armed opposition to the religious and political changes in France is denoted, and which burst out into a species of partisan warfare in 1793, 1794—1795, 1799, and 1815), see CATHELINEAU, LAROCHEJACQUELEIN, HOCHE, CHOUANS, &c.

VENDÉMIAIRE (i.e., the 'Wine-month') embraced, in the calendar of the first French Republic, the period from the 23d September to the 21st October. Particularly memorable in the history of the Revolution is the 13th Vendémiaire of the year IV. (5th October 1795), when the Paris 'Sections,' worked upon by royalist reactionaries in all sorts of ways, rose against the National Convention, but were decisively beaten by a military force under the command of Barras, or rather of his lieutenant, Napoleon Bonaparte, then a young officer only beginning to be known. The victory of the Convention saved the Republic—for a time.

VENDE'TTA (vengeance), the term used to denote the practice, as it prevails in Corsica, of individuals taking private vengeance upon those who have shed the blood of their relations. In Corsica, when a murder has been committed, the murderer is pursued not only by the officers of justice whose duty it is to punish offences against society, but also by the relatives of the slain, upon whom the received views of social duty impose the obligation of personally revenging his death. In such a case, the relatives of the murdered man take up their arms, and hasten to pursue, and if they can find him, to slay, the murderer. If he succeed in eluding their pursuit, the murder may be revenged upon his relatives; and as the vengeance may be taken whenever an opportunity occurs, the relatives of a murderer whose crime is unavenged have to live in a state of incessant precaution. When they go to the fields, they take their arms with them, and set a watch; at home, they have their doors well fastened, and their windows barricaded; and since the avenger is never far distant, they live, in fact, in a state of siege. Instances are on record of persons who were, as the phrase is, 'suffering the vendetta,' having lived shut up in their houses for 10 or 15 years, and being, after all, shot on the first occasion on which they ventured out of doors. Formerly, when blood had been shed, there was a custom of proclaiming the war of revenge, and announcing to what degree of relationship it should extend; but this custom is gone out of use. Frequently, in the practice of this system of vengeance, each of two sets of relatives has a murder to revenge upon the other; the vendetta, that is, crosses. This is called the *vendetta transversale*. The duty of taking vengeance lies primarily and especially upon the next of kin. Not to take revenge is deemed in the highest degree dishonourable; and any delay in doing so on the part of the next of kin is made matter of reproach by his relatives. When the Genoese were masters of the island, their laws declared the *rimbicco*—the uttering of such reproaches—punishable

as an incitement to murder. But there is seldom occasion for the rimbicco, for the Corsican is brought up to regard the vendetta as the most sacred duty of man. The women instigate the men to revenge by singing songs of vengeance over the body of the slain, and displaying his blood-stained garments. Often a mother affixes to her son's dress a bloody shred from the dead man's shirt, that he may have a constant reminder of the duty of taking vengeance. Although the vendetta usually has its origin in bloodshed, smaller injuries may give rise to it, and even purely casual occurrences. Mediators, termed *paroianti*, often interpose to make up a quarrel. When they succeed, an oath of reconcilement is taken, and this oath is regarded as specially binding. It is infamous to break it; nevertheless, it is broken now and then. Brigandage prevails to a great extent in Corsica, and the origin of the career of a brigand, in almost every instance, can be traced to the vendetta. A man commits a murder out of vengeance; he flees to the hills; it never is safe for him to resume his former life again, and so he turns robber for a living. Besides the vendetta, properly so called, hereditary family feuds are very common in Corsica; and sometimes there are hereditary feuds between whole villages. The great families of the island hand down feuds from generation to generation, in which not only themselves and all their relatives, but all their servants and dependants are involved—the kind of feud which was common in the Italian towns of the middle ages, and which is illustrated in the play of *Romeo and Juliet*.

The origin of the vendetta has often been referred to the lawlessness which prevailed in many parts of Corsica during the period of the Genoese domination, and to the venality which vitiated the Genoese administration of justice. And, no doubt, the insecurity and the mal-administration of justice which existed in Corsica for ages, helped to consolidate this barbarous custom; which, thus consolidated, has been perpetuated by the isolated position of the country, and the absence of civilising influences. But the explanation of its origin must be sought in more general causes, for it is not exclusively a Corsican custom. On the contrary, it may be safely affirmed that a system of private vengeance, almost precisely similar, has existed amongst every people during certain stages of its progress—never entirely passing away until government became strong enough to insure redress of injuries, and to restrain the passions of individuals.

In the case of rude tribes, in the savage or semi-savage state, there is on record such a multitude of instances of the existence of the blood-feud, that its universality among men in that state cannot be doubted. Its incidents are usually the same which Sir G. Grey found subsisting among the aborigines of Australia, and of which, in his *Journals of Travel in the North-west of Australia*, he has given a vivid description. The Australian tribe usually includes several stocks or bodies of men, between whom blood-relationship is acknowledged; and every member of a stock is bound to assist in taking vengeance for a personal injury done to any of his kinsmen. On the other hand, though a hunt is always made for the actual wrong-doer, the injury may be satisfactorily avenged upon any member of his stock. As in the Australian and similar tribes, there is no relationship acknowledged between members of the same family unless they are also members of the same stock (see article TRIBE), the blood-feud occasionally arrays father against son, and brother against brother. It often leads to the break-up of a tribe.

Of the prevalence of the blood-feud among tribes which have advanced to what is called the patriarchal state also, there is very ample evidence. Among such tribes, the cohesion of the family is very powerful; everything relating to the family is quasi-sacred; and the duty of taking vengeance for kindred blood is not merely a matter of honour, but of religion. Volney's description of the blood-feud, as practised among the Bedouins, will do for all the tribes of this class; and it might almost stand for a description of the vendetta. 'The interest of the common safety,' he says, 'has for ages established a law among them (the Bedouins) which decrees that the blood of every man who is slain must be avenged by that of his murderer. This vengeance is called *Tar*, or retaliation; and the right of exacting it devolves upon the nearest of kin to the deceased. So nice are the Arabs upon this point of honour, that if any one neglects to seek his retaliation, he is disgraced for ever. He therefore watches every opportunity of revenge; if his enemy perishes from any other cause, still he is not satisfied. His vengeance is directed against the nearest relation. These animosities are transmitted as an inheritance from father to children, and never cease but by the extinction of one of the families, unless they agree to sacrifice the criminal, or purchase the blood for a stated price in money or in flocks. Without this satisfaction, there is neither peace, nor truce, nor alliance between them, nor sometimes even between whole tribes. The blood-feud is observed, almost precisely as described above, among the Circassians, the Druses, and the numerous hordes of Central Asia; it seems to have had the same incidents, too, among similar tribes in ancient times—e. g., among the Greeks of the Homeric period, among the Germans in the time of Tacitus, among the northern nations who overran Europe after the fall of the Roman Empire. The Corsican vendetta seems to be the same thing as the Bedouin Tar, surviving, with slight modifications, in a secluded island, where the law has never made itself supreme, long ages after the progress of society and the consolidation of government have effaced every trace of it, except at a few isolated points on the neighbouring continent of Europe. The vendetta exists in Sicily and in Sardinia, as well as in Corsica; in Calabria also; and it (or we should rather say, the blood-feud) flourishes vigorously among the Montenegrins and the Albanians.

The right of private war which subsisted in Europe in the middle ages—introduced by the northern nations who shared the spoils of the Roman Empire—was just a modification of the blood-feud. This right belonged only to the nobility, and could be exercised only against men of equal rank. It was usually resorted to on account of insults publicly done, of atrocious acts of violence or bloodshed, and similar injuries. The right of vengeance devolved first upon the next of kin; but all the kindred within the degrees of relationship to which the ecclesiastical prohibitions of marriage extended, were bound to take up the quarrel; and this obligation was so far sanctioned by law, that if any one failed to fulfil it, he was deemed to have renounced his kindredship, and to have lost his rights of succession. Vassals, equally with kinsmen, became implicated in the vengeance of their lords; and every person present when the cause of quarrel arose was required to take side with one or other of the parties. For several centuries, private wars were constantly being waged within the kingdoms of the continent, and the efforts of kings and ecclesiastics to restrain them produced little effect until governments became strong enough to prohibit them, and to enforce the prohibition.

It is now apparent that the vendetta represents a system which prevailed everywhere before the

consolidation of society into the state, and the establishment of a police capable of protecting life and property. This system was a rude substitute for government and the administration of justice. The family, or the body of kindred, formed, in fact, a commonwealth of itself; its members held firmly together; and when one was injured, all the little state was injured. The Nagas have no government, and among them the blood-feud is the only check—it is not altogether inefficient—upon the selfishness and the passions of individuals. As society became consolidated, the exercise of this right of vengeance was curtailed—remaining longest with the nobility, who counted it as one of their most valuable privileges, and maintained it as long as possible. They had to surrender it at last, because the state grew strong enough to supersede the action of individuals in redressing injuries, and was able to do this with greater fairness, and without the same admixture of calamitous results.

VENDOME, House of. V. was an old county of France, erected into a duchy by Francis I., for behoof of Charles of Bourbon, the grandfather of Henry IV. On the accession of the Bourbons to the throne, it was reunited to the crown, but again separated from it by Henry IV., who conferred it upon Cesar, the eldest of his sons by Gabrielle d'Estrées. Cesar's eldest son, Louis, Duke of Vendome, married Laura Mancini,* one of Mazarin's nieces, and had by her three sons, the eldest of whom was Louis-Joseph, Duke of Vendome, the celebrated French general who so distinguished himself during the war of the Spanish Succession. He was born at Paris, July 1, 1654, and made his first appearance on the field of battle as a lifeguardsman during the Dutch campaign of 1672, afterwards serving with distinction under Turenne in Germany and Alsace, and under Crequi in Flanders. Released by the peace of Nimeguen (1678), he retired to his château of Anet, near Dreux, where he resigned himself to the most liberal indulgence in all kinds of pleasure. At this time, he became compromised in the affair of Lavoisin (see Poisoning); but it turned out that his intercourse with the pretended seer was prompted merely by curiosity. On the outbreak of war in 1688, he was ordered to the Low Countries, where, under Luxembourg (q. v.), he earned deserved renown at the sieges of Mons and Namur, and the battles of Leuse and Steenkerk; and his high reputation was not diminished by his subsequent conduct in Italy, where he commanded the left wing of Catinat's army at the battle of Marsaglia (October 4, 1693). But V.'s brilliant gallantry and military talents had not hitherto succeeded in obtaining for him the honour of an independent command, for it was only too evident that with these valuable qualities were combined inveterate indolence, and careless and disorderly habits, which might, as effectually as the most utter incapacity, ruin the chances of any enterprise under his management. However, the necessities of the case induced Louis ultimately to give him (1695) the command of the army in Catalonia; and he was agreeably surprised at the alertness of V., who closed a series of brilliant successes by the capture of Barcelona, an exploit which did much to bring about the peace of Ryswick (1697). After five years of inaction, spent in sloth and sensuality, he was despatched by his sovereign to supersede Villeroy in Italy. His arrival was hailed enthusiastically by the soldiery, who relied implicitly upon his brilliant genius and happy audacity to extricate them from all difficulties, and with whom his excessive laxity in the matter of discipline rendered him a great favourite. The restored confidence of the troops was proved by the victories of Ustiano and San-Vittoria; while the enforced retirement of Prince Eugene beyond the Mincio equally shewed the superior strategic abilities of their general; and it required the utmost exercise of both to prevent the surprise at Luzzara (August 15, 1702), brought about through V.'s usual carelessness, from becoming a total rout. From this time, a slight though temporary improvement in V.'s habits is visible; in 1703, he drove the Austrians before him into the Tyrol, repeatedly defeating Starhemberg; when the defection of the Duke of Savoy forced him to retreat. The duke, though joined by Starhemberg, was beaten again and again, and at last cooped up in Turin, whither Eugene was advancing to his relief, when the defeat of his advanced guard by V. compelled a halt. The imprudent Frenchman, however, intrusted the difficult duty of holding Eugene in check to his younger brother, the grand-prior, who, though a gallant soldier, was no match for his opponent in generalship; and had not V. returned to Cassano just in time to divide the honours of the battlefield with his opponent, the army of observation would have been scattered to the four winds of heaven. Again, partially stimulated by this narrow escape, V. displayed unwonted vigour, and drove the Austrians into the Trentin; but in the summer of 1706, he was recalled to supersede Villeroy, who had blundered in the Low Countries, as he had formerly done in Italy. Unfortunately, V.'s besetting faults were attempted to be remedied by uniting the Duke of Burgundy with him in command; and the want of a thorough understanding between the conjoint chiefs led to the defeat of the French at Oudenarde (q. v.), and to the failure of the attempt to relieve Lille. The cause of these reverses formed the subject of vehement discussions in France, and though undoubtedly V. was mostly to blame, his great reputation gained him the public support; yet Louis XIV. held him in a sort of disgrace for a time. In 1710, a cry of distress arose from Spain, where the British and Austrians were carrying all before them; and in compliance with the urgent request of Philip V. (who had served under V. in Italy) to his grandfather to send him—not a reinforcement, but only V., the heroic old debauchee was once more roused up from his lair, and despatched to Spain. His appearance, like that of Du Guesclin more than three centuries before, brought together as if by magic a numerous army of volunteers; towns, villages, and even religious establishments united in a most enthusiastic manner to contribute the necessary funds, and Philip was settled in his capital before the close of the year. A week after, Stanhope and the British troops were defeated and captured at Brihuega; and on the following day, Starhemberg and the Austrians were completely routed at Villa Viciosa. The grateful monarch raised his deliverer to the rank of a prince of the blood-royal, and presented him with 500,000 livres (£20,000), a gift which V. accepted only to distribute it among his soldiers. V. for the last time relapsed into his usual habits, and after 'a month of extraordinary gluttony,' died of indigestion at Vinaroz in Valencia, June 15, 1712. V., of all the descendants of Henry IV. both then and since, bears the strongest resemblance to his great-grandfather; but of the resolute persistency and self-denial of the first and greatest of the Bourbon monarchs, we cannot discern in him

* It is curious to remark the relationship between the opposing leaders in the great war of 1700—1713. Vendome (French) and Prince Eugene (Allied) were cousins; Vendome was second cousin to the Duke of Burgundy; Eugene was similarly related to the Duke of Savoy; and Marlborough (Allied) and Berwick (French) were uncle and nephew.

the slightest trace.—Saint-Simon's biography of V., and Voltaire's *Siècle de Louis XIV.*, are the principal authorities for the life of this extraordinary man.

V.'s disinterestedness, like his other good qualities, and they were not a few, became a vice from its very extravagance. It is related that one of his domestics demanded permission to leave his service on the ground that he could not stand by to see a master robbed by his servants in such a barefaced way. 'Is that the reason?' said V.; 'very well, then, rob like the others.'

VENDOME, a town of France, in the dep. of Loir-et-Cher, seated on vine-clad hills, on the Loir, which here divides itself into many canals, 45 miles west-south-west of Orleans. It contains cavalry barracks; a theatre; the church of the Trinity, a remarkable edifice; one of the most beautiful colleges of France; and the ruins of a lofty castle. Manufactures of cloths, needles, and embroideries are carried on with activity. Pop. 9400.

V., a very ancient town, and said to have been of importance under the Merovingians, was the capital of the ancient county of Vendomois, which was erected into a duchy-peerage by Francis I., in favour of Charles de Bourbon. Henry IV. conferred it on one of his natural sons, who thus became the founder of the House of Vendome. The county is now represented by the departments of Loir-et-Cher and Sarthe.

VENEE'R (Fr. *fournir*, to furnish), a layer of wood, cut very thin, for the purpose of being glued on to the surface of a commoner kind. Only choice kinds of hard woods are sawn into veneers, and they are usually attached to deal or pine, so as to give all the appearance of being made solid. In this way, the more costly kinds of furniture-woods are economically used by the cabinetmaker, for with the improvements which have been effected in the process of sawing, veneers as thin as paper have been produced.

VENE'REAL DISEASE. See SYPHILIS.

VENE'RIDÆ, a family of lamellibranchiate molluscs, having a regular, closed, bivalve shell; the teeth and laminæ of the hinge near together in a single group under the beak (*umbo*); generally three diverging teeth in each valve; a marked oval impression in front of the beak; the general form similar to that of the cockles (*Cardiaceæ*), but usually more flattened. The mantle has a large opening in front; the siphons are unequal, more or less united; the foot is tongue-shaped, compressed, sometimes grooved, and producing a Byssus (q. v.). The species, all of which belong to the Linnæan genus *Venus*, are very numerous. They are very widely distributed, but abound chiefly in tropical seas. About forty are found on the British coasts, some of them very common. The V. are generally elegant in form, and often finely coloured. Some of them have the shell furnished with long spines, but chevron-shaped lines are their common ornament. The V. first appear in the oolitic rocks, and are more abundant in the present than in any former geological epoch.

VENESE'CTION (occasionally termed PHLEBOTOMY, and popularly known as BLOOD-LETTING or BLEEDING) is an incision into a vein, for the abstraction of blood. Although the operation may be performed on many of the superficial veins, it is restricted in this country to the veins at the bend of the elbow. Of these veins, the most prominent are the median-cephalic and the median-basilic; the former being situated on the outer side of the tendon of the biceps muscle, while the latter lies on the inner side, and only separated from the brachial artery by a thin layer of fascia. Hence, from fear of wounding the artery, the median-cephalic should be preferred; but in reality the median-basilic is usually selected, in consequence of its being the more prominent and larger vein of the two. The appliances required are a lancet, a bleeding-tape or narrow bandage, lint, a bowl to receive the blood, a basin of water, and a sponge. The patient being placed in a sitting position, the tape or bandage must be tied sufficiently tight around the middle of the upper arm, or rather lower, to arrest the venous circulation without materially affecting the pulse at the wrist. The forearm having been allowed to hang down till the veins are tense, the operator must make his selection, and taking the blade of the lancet between the forefinger and thumb of the right hand, should fix the vein by pressing his left thumb upon it just below the part he is about to open. Steadying his hand by resting the ends of the three outer fingers on the forearm, he should steadily (and without a jerk or plunge) introduce the point of the lancet obliquely until the interior of the vessel is reached, and the blood is seen rising up. Without penetrating deeper, he should thrust the instrument forward, so as to open the vein longitudinally to a sufficient extent. On now removing the thumb, the blood should emerge in a full jet; and if the stream be scanty, the patient may have a hard body—as a piece of stick or a pocket-knife—placed in his hand, with directions to grasp it firmly, or the surgeon may increase the flow by chafing the palmar surface of the forearm, rubbing from below upwards. When a sufficient quantity of blood has been abstracted, the thumb of the left hand should be placed on the wound, and the ligament loosened; a small pad of lint should then be placed over the orifice, the surrounding parts should be cleaned of blood by a sponge, and the pad of lint compressed against the arm by the tape or narrow bandage, applied in the figure-of-eight form, with the crossing of the tape lying on the pad. After the operation, the arm should be carried in a sling for a day or two. We have, contrary to our ordinary custom, given the details of the operation, because it is one which, if performed at the proper moment, may be the means of preserving life, and which any person of ordinary intelligence could probably perform more safely, after reading these directions, than the farriers, barbers, &c. who are frequently called upon to perform it in remote country districts and in the backwoods of the colonies. Amongst the occasional ill consequences of venesection may be mentioned: (1) The escape of blood into the surrounding cellular (or connective) tissue, giving rise to a swelling called a *Thrombus*, which, if it does not rapidly become absorbed, should be emptied by the lancet. This is due to a want of coincidence between the wound in the integument and in the coats of the vein. (2) Phlebitis, which generally arises from the use of an unclean lancet. (3) Varicose aneurism and (4) Aneurismal varix, both of which may be included under the term Arterio-venous Aneurism, since in each case there is an aneurismal dilatation of an artery communicating with a vein; while they differ in this respect, that varicose aneurism is said to exist when an artery has been punctured through a vein (in this case, the brachial artery through the median-basilic vein), and a false or traumatic aneurism, composed of lymph that was effused between the vessels, has formed between them, and opens into both; while aneurismal varix is similarly produced, but the two vessels adhere together, the communication between them remaining permanent. These diseases often have such a tendency to remain stationary, that no interference is necessary; occasionally, however, very serious

surgical treatment is required, for details of which we may refer to that excellent article on 'Aneurism,' in Holmes's *System of Surgery.*

In children, and occasionally in others, where the veins of the arm are small and undefined, blood is drawn from the external jugular veins. As this operation would only be performed by a surgeon, it is unnecessary to describe it; and we will merely remark, that as the entrance of air into the vein during the operation, or until the orifice of the vein has been closed, would cause instant death,* this vein should only be opened in extreme cases.

We have no space to notice at any length the general results of bleeding, or the much disputed question, whether venesection should not be discarded from our list of operations,† because no rational doubt can be entertained that, although, until a quarter of a century ago, or later, there was a most unnecessary and probably hurtful effusion of blood, venesection, in properly selected cases, is one of the most valuable remedies. A patient can bear a much greater loss of blood in the horizontal position than when sitting, and in that position than when standing. The condition required to be produced is that there should be incipient faintness; and the loss required to produce this effect varies extremely in different individuals and in different diseases. The late Dr Marshall Hall, in his work *On the Effects of the Loss of Blood*, states that the average loss of blood required to produce slight faintness in a healthy person in the sitting position is 15 ounces. In some diseases, more, and in others less, than this loss can be borne. The greatest loss can be borne in congestion of the head, or tendency to apoplexy (from 50 to 40 ounces); then in inflammation of the serous membranes and of the parenchymatous substance of various organs (from 40 to 30 ounces); then acute anasarca (about 20 ounces); and then inflammation of the mucous membranes (about 16 ounces); while the system bears less than the quantity borne in health, in the eruptive and other fevers, in delirium tremens, dyspepsia, and chlorosis—a set of diseases in which blood-letting is now scarcely ever resorted to.

VENETIAN CHALK, a variety of soap-stone or steatite, used sometimes in the manufacture of drawing crayons.

VENETIAN STYLE of Architecture. This term is applied to the particular phase of the Renaissance developed in Venice. Under the head Italian Architecture, the peculiarities of the various schools of Italian architecture are pointed out. The Venetian is the most picturesque and ornate, as compared with the styles of Rome and Florence. 'Venetian-Gothic' indicates the peculiar phase of that style so common in Venice and the north of Italy, and chiefly applied to domestic architecture. See Gothic Architecture.

VENEZUELA, a republic in the north-west of South America, bounded on the N. by the Caribbean Sea, on the W. by the United States of Colombia (New Granada), on the S. by Brazil, and on the E. by British Guiana. Lat. 1° 20′—12° 25′ N.; long. 59° 45′—73° 17′ W. Within recent years, the country has been variously subdivided. In 1869, there were 13 provinces—those of Apure, Barcelona, Barinas, Barquisimeto, Carabobo, Caracas, Coro, Cumana, Guiana, Maracaybo, Margarita, Merida, and Truxillo—with an aggregate population of 945,408. At a former period, the number of provinces was increased to 21, by subdividing 8 of the original provinces. In 1863, after the Federals had conquered the Unionists, a confederation was formed, and the number of the states was to be reduced to 7. But later, in March 1865, the states were reported to be 20 in number (*Almanach de Gotha*, 1866). The number of states is at present 13; the area of the country is known to be 368,235 sq. m.; the pop., according to the latest enumeration, is 1,564,433. The coast-line, extending from east to west—from the delta of the Orinoco to the boundary of the United States of Colombia—is 1584 miles in length. The most easterly part of the coast-line, 150 miles in length, and formed mostly by the delta, is washed by the Atlantic, and is very low. The waters of the Gulf of Paria beat upon bold and rocky shores. The remainder of the coast-line, including the north shore of the peninsula of Paria, is washed by the Caribbean Sea, and the coast, for the most part low and marshy, is sometimes precipitous, the mountains rising like a wall from the water's edge. With trifling exceptions, the country is abundantly watered. Its great river is the Orinoco, which drains by far the greater part of it, and the course of which is almost wholly within its boundaries. The other greater rivers of V. are affluents of the Orinoco (q. v.). Numerous streams, small in comparison with the great rivers, flow north into the Caribbean Sea and the Lake of Maracaybo (q. v.), which is by far the largest lake in the country. The Andes enter V. from the west, and divide into two branches, the first of which runs north toward the coast, under the names of the Sierra de Perija and the Montes de Oca, but rise no higher than 4200 feet; while the other branch, running in a north-east direction, terminates near the coast, in long. 68° 30′ W., and attains a much greater elevation. That part of the north-east branch of the Andes called the Sierra Nevada de Merida, and situated about 100 miles south of Lake Maracaybo, contains the only mountain that rises above the line of perpetual snow, and the two peaks of which are 15,342 and 15,310 feet high respectively, the loftiest in the country. South and south-east of the Orinoco, are the most mountainous districts of Venezuela. They form a vast, confused, and mostly unexplored region, but none of these mountains rise to the height of the main peaks of the Andes. The country embraces vast table-lands, known under the names of *Llanos, Paramos, Mesas*, and *Punos*. There are extensive, low, marshy tracts along the coasts and the lake and river banks, which, however, are abundantly fertile during the dry season. For the most part, the soil of the country is fertile. In the mountainous district in the south-east, there are great tracts well suited for the production of grain. Of this region, the lands not more than 2000 feet above sea-level are called *tierras calidas*, or hot lands; those between 2000 and 7000 feet are called *tierras templadas*, temperate lands; and those above 7000 feet are the *tierras frias*, cold lands, in which the average temperature is 49° F., and which are mostly uninhabited. The warmest tracts are the palm-lands; and the sago-palm, cocoa-palm, and others, grow here to a most colossal size, and yield most valuable products. Among the forest trees are the mahogany, satin-wood, rosewood, black and white ebony, and caoutchouc; and there are forests of

* Few deaths are more rapid than those caused by the entrance of air into the veins of the neck. Many surgical operations in that region have proved fatal from this cause; and the knowledge of this fact has been applied to the slaughtering of horses, oxen, &c. It is probably one of the most humane forms of destroying life.

† On this subject, the non-professional reader may consult a long foot-note to Dr (now Sir Thomas) Watson's *Lectures on the Principles and Practice of Physic*, 4th ed., vol. i. pp. 231—234; and Dr Markham's *Lectures on the Change of Type in Disease; with a Letter by Sir Thomas Watson*, 1866.

the cinchona or Peruvian-bark tree. The cocoa and coffee trees, sugar-cane, indigo, and cotton plants are cultivated. Vegetables in great variety are raised, and tobacco is a profitable crop. Among the wild animals are the puma, ounce, and wild-cat; the jaguar is now becoming rare. The alligator, crocodile, boa-constrictor, and rattlesnake are found. Of domestic animals, great herds of cattle and wild-horses roam over the *llanos*, and mules, asses, sheep, goats, and pigs are reared. The inhabitants are made up of whites of Spanish extraction; Indians, who are docile and industrious, and are the miners, agriculturists, and manufacturers of the country; some negroes and mixed races. Agriculture is the great pursuit, though only about one-tenth of the whole area is under cultivation. Manufactures are few; commerce is important, and would be much more so, were there well-constructed roads and other means of conveyance than mules. The principal articles of export are coffee, cotton, cocoa, sugar, indigo, tobacco, salt, hides, live-stock, tallow, horns, sarsaparilla, dye-woods, and timber. The imports are manufactured goods, provisions, and wine. During the years 1865—1869 the total imports averaged $5,000,000, and the exports about $6,000,000, per annum. The religion of the mass of the people is Roman Catholic; but other forms of religion are tolerated.

History.—The east coast of V. was discovered by Columbus in 1498; Ojeda and Vespucci followed in 1499, and, entering Lake Maracaybo, they found an Indian village constructed on piles, to prevent the evil effects of inundation, which they named Venezuela, or little Venice, a name which was afterwards applied to the whole country. The first settlement was made at Cumana in 1520, by the Spaniards; and V. remained subject to Spain till it claimed independence in 1811. In 1812, it returned to allegiance to Spain, but again revolted in 1813, and, forming with New Granada and Ecuador the republic of Colombia, it was declared independent in 1819. In 1831 the states separated, and a condition of revolution and anarchy prevailed for the most part in V. until 1863, when a provisional constitution was formed establishing the republic and guaranteeing to the people important privileges.

VE'NIAL SIN (Lat. *veniale*, pardonable, from *venia*, pardon), a term used, chiefly in Roman Catholic theology, to denote the less heinous class of offences against the law of God. Roman Catholic divines infer from many passages of Scripture that there are various grades of guilt in the culpable actions of man, and that these varieties of guilt involve a corresponding variation in the liability to punishment which is thereby entailed. Lowest in this scale of imputability is the class of offences known as venial, and by this name distinguished from those which are called mortal. Much difference of opinion exists even among Catholics themselves as to the nature and origin of this distinction. Some ancient writers explained mortal sins as being offences against a *precept*, whereas venial sins are but violations of a *counsel*. This explanation, however, is now universally rejected; and it is held that sin, of its very essence, whether mortal or venial, supposes the violation of a *law* or precept. Another explanation of the difference declares mortal sin to be that which deprives the soul of sanctifying grace; whereas venial sin only weakens and diminishes, but does not utterly extinguish sanctifying grace in the soul. This is an explanation, however, rather of the effect than of the nature of venial sin; and the more received opinion is that of St Thomas Aquinas, who explains mortal sin to be that which of itself subverts *the end* of the law; whereas venial sin but diverts it in a greater or less degree from that to which God intended that it should be directed. Catholics, while insisting on this distinction, are careful to explain that venial sin, although absolutely pardonable, is not to be supposed to be easily pardonable. They hold that it is of its own nature a great 'deordination,' and that it may and does entail a heavy liability to punishment, although not to the eternal punishment of hell, which is reserved for mortal sin. Sins may be venial either objectively or subjectively; objectively, when the 'object' of the law, or what is technically called the 'matter' of the sin, is light or trivial; as in the case of a petty theft, a slight departure from truth, or a passing ebullition of impatience or anger; subjectively, when, even though the 'matter' or 'object' is grave, there is but imperfect advertence, or not full consent, on the part of the subject or agent; as in the case even of a grievous injury done without full knowledge or intention on the part of the agent, or without full and deliberate consent. The degree of culpability in each case is supposed to depend on the objective or subjective qualification of the act. Catholics hold that persons dying in a state of venial sin are not excluded for ever from heaven; but that, since nothing unholy, even though in a minor degree, can approach God, the soul departing from life so stained with venial sin, is compelled to undergo a purification in Purgatory (q. v.), which they conceive to be of greater or lesser severity and duration according to the degree of culpability. Some of these writers teach that even venial sins involve punishment of extreme severity; and all expressly declare that it is never lawful, under any circumstances, to commit the smallest venial sin, even for the purpose of compassing a good and holy object.

Protestants reject the whole doctrine of *mortal* and *venial* sins. They regard all sins as, in one sense, *mortal*, i. e., as exposing the sinner to 'the wrath and curse of God, both in this world and that which is to come;' but all sins of the believer are expiated by the blood of Christ, so that there remains no penalty to be paid, either by penances in this world, or by sufferings after death. The very notion of venial sins appears to them to make light of the law of God; whilst that of the expiation of venial sins by the sufferings of the sinner himself, is inconsistent with their doctrine of justification, and with their views of the efficacy of the sacrifice of Christ.

VE'NICE, a fortified city of Northern Italy, one of the noblest, most famous, and singular cities in the world, is built upon a crowded cluster of islets, in the lagoon of the same name, on the north-west fringe of the Adriatic Sea, 23 miles east of Padua by the Milan and Venice Railway; lat. 45° 25′ N., long. 12° 20′ E. The lagoon of V. is banked off from the Adriatic by a long, narrow sandbank, extending south-west from the mouth of the Piave to that of the Adige, and divided into a number of islands by narrow sea-passages, six in number. Formerly, the chief of these entrances into the lagoon was the *Porto di Lido*, through which all the great merchantmen of the republic passed direct into the city, and which is still frequented by small vessels, and by the Trieste steamers. The Porto di Malamocco, between the island of the same name on the south, and that of Lido on the north, is now the deepest channel into the lagoon. Inside of this sandbank, and between it and the mainland, which is from three to five miles distant, is the lagoon—a sheet of shallow water, navigable for vessels of very light draught, except where channels have been formed naturally by rivers, and artificially maintained. In some parts of this marshy, sea-covered plain, islets have—by the action of currents and otherwise—become consolidated into ground firm

enough to be built upon, and fruitful enough to be cultivated; and in the midst of a crowded cluster of such islets, amounting in number to between 70 and 80, the city of V. is built. In the vicinity of V., the ebbing tide (the difference between high and low water is only between 2 and 3 feet) lays bare nearly everywhere a great plain of calcareous mud, laced, however, by an intricate network of narrow channels, from which the sea never retires; while at high water the whole surface is covered by the sea to the depth of from 1 to 1½ feet. The chief of the islands upon which V. is built is called *Isola de Rialto* (i. e., *rivo alto*), or Island of the Deep Stream. The islands, in many places only shoals, afford no good foundations for buildings; and the city, for the most part, is built upon artificial foundations of piles or stone. The fact that this city of marble palaces seems to rise vision-like from the unsubstantial sea, is sufficient to render its aspect at all times more or less fascinating; but in summer and autumn, the seasons of the highest tides, when the Grand Place of St Mark's is partially flooded, and when the image of each palace is doubled by reflection in that 'green pavement, which every breeze breaks into new fantasies of rich tesselation,' the city is indeed marvellously beautiful. The Canalazzo, or Grand Canal—its tortuous course through the city being in the form of the letter S reversed, thus, ꙅ—divides V. into two unequal parts, and is the main thoroughfare for traffic or pleasure. But the city is subdivided by 146 smaller canals, or *rii*, as they are termed. These are the water-streets of V., by means of which passengers can be conveyed to any quarter, for here the canal is the street, and the Gondola (q. v.) is the cab or carriage. Access can also be had to all parts of the town by land—across the canals by bridges, and along their banks by narrow passages called *calli*. There are in all 306 public bridges, and of these, three cross the Grand Canal—the Rialto, a stone structure, and the most famous; and two iron bridges. The Piazza or Square of St Mark's is the great centre of business and amusement, and the locality most frequently visited by travellers in Venice. It is 576 feet in length, 269 feet in greatest width, and 185 feet in least width. The east side of this square is occupied by St Mark's Church. The first church of St Mark's was built in 813, but was destroyed by fire in 976. It was rebuilt in 1071, and consecrated before the close of the 11th century. The edifice is Byzantine, with Gothic additions of the 14th c., and Renaissance alterations of the 17th century. It became the cathedral and seat of the Patriarch in 1807. The plan of St Mark's is the Greek cross. Above the doorway are the four famous horses which Marino Zeno brought from Constantinople in 1205, which were carried away by Napoleon in 1797 to Paris, and restored to V. in 1815. A great dome rises over the intersection of the lines of the cross; and over the transepts, other domes arise. The carved work, which is very profuse, is of the most exquisite description; and the building is perfect as an example of the delicately coloured architecture of the East. The structure is of brick, incrusted with richly coloured marbles. To the right of this beautiful edifice is the *Torre dell Orologio* (built in 1494), with a splendid dial in gold and azure, and very complex and ingenious movements. The north side of the square is almost entirely taken up by the *Procuratie Vecchie*, built in 1517, for the accommodation of the Procurators or trustees of San Marco, who had the care of the edifice, the management of its property, &c. Facing the Procuratie Vecchie, and on the south side of the square, are the buildings of the *Procuratie Nuove*, which are connected with a façade, which forms the west side of the square; and the two buildings constitute the *Palazzo Imperiale*. Leading south from the Piazza is the Piazzetta, or Little Square; and near the point where it makes an angle with the great square, is the Campanile, or Bell Tower, of St Mark, placed at some distance in front of the building to which it belongs. It was begun in 902, and completed in 1510, is 323 feet high, 42 feet wide at the base, and is surmounted by an angel, which serves as a weathercock, and is said to be 30 feet high. On the west side of the Piazzetta are the old Library and the Mint, the former now forming a part of the Palazzo Imperiale. At the south of the Piazzetta are the two famous red granite columns of V., one of which is surmounted by a figure of St Theodore, the patron saint of the republic till St Mark supplanted him; the other covered by the lion of St Mark. On the east side of the Piazzetta stands the Palazzo Ducale or Doge's Palace. The first palace reared on the site of the present one was built in 813, and though frequently enlarged, rebuilt, and re-decorated, it retained throughout the character of a Byzantine structure. In the year 1301, its architectural character began to change; and from that time till 1423, all the rebuilding and enlarging were executed in Gothic. After the date 1423, there are no buildings in Venetian architecture, properly so called; and the alterations made in the Ducal Palace after that time, as well as the palaces subsequently built, which took their style of architecture from the Doge's Palace, were in Renaissance, and like almost all the architecture now to be seen in V., 'of immeasurably inferior spirit in the workmanship' to that native style which flourished with the republic, and decayed with it. Starting from the landing-place of St Mark's at the east extremity of the Grand Canal, and proceeding west, a great number of palaces are passed. In former times, these palaces, or the magnificent buildings which occupied the same sites, were the warehouses and places of business of the great merchant-princes, most of whom possessed mansions in the suburbs, i. e., on some neighbouring island, which afforded more privacy than could be found in the city itself. A few of these are worthy of mention. Among them are the *Palazzo Giustiniani*, now the *Albergo dell' Europa*, perhaps the best hotel in V.; the *Palazzo Contarini Fasan*, a beautiful specimen of the richest Venetian Gothic of the 14th c.; on the left bank, the *Palazzo Pisani a S. Polo*, in arabesque Gothic of the beginning of the 15th c.; further on, on the right, the *Palazzo Loredan*, the *Ca' d'Oro*, a building of the 15th c., in the oriental style, restored by Mademoiselle Taglioni, the celebrated dancer. The bridge of the Rialto crossing the Grand Canal consists of one arch, the span of which is 91 feet, and the height from the water 24½ feet. The width is 72 feet, and the bridge is divided into three streets—the middle one 21 feet wide—and two rows of shops. The Bridge of Sighs (*Ponte dei Sospiri*) stretches across the canal called the Rio Palazzo, and communicates between prisons on the east, and the Doge's palace on the west bank of the canal. It is a covered gallery; and prisoners, when led to execution, passed from their cells across this gallery to the palace, to hear sentence of death passed upon them, and then were conducted to the scene of death between the red columns. The churches of V. are, as a rule, fine edifices, and of various styles. The styles are chiefly, first, Venetian Gothic, massive and solemn; second, Lombard; third, classical, i. e., Italian; fourth, decorated Italian. Among the chief churches after St Mark's are those of the *Frari*, with a colossal monument of Titian, a number of excellent pictures, &c.; and the church of *S. Giacomo di Rialto*, at the foot of the

bridge of the same name, occupies the site of the first church erected in V. in 421. But of the multitude of churches, a great many, though of pleasing proportions, are in the later and degraded styles of architecture. The Fine Art *Academia* is located in the ancient convent of *La Carità*, was formed in 1807 by Napoleon, and consists of several schools, and has the finest collection of pictures of the Venetian school, including works by Titian, Tintoretto, Bonifacio, Giovanni Bellini, Paolo Veronese, and many other masters. Specimens of the works of these artists are also to be found in many of the palaces

Grand Canal, Venice.

and churches of the city. There are several theatres, the chief of which is *la Fenice*. Fresh water, formerly, and even still to some extent, obtained at great expense, and of bad quality, from the mainland, or kept in cisterns, is now obtained by means of a number of Artesian wells, sunk in 1847, at the expense of the municipality. The library of St Mark's contains 120,000 vols., and 10,000 MSS. Many writers have led to misconception by omitting to note the fact, that the V. of to-day is by no means the same city as the V. of earlier and more famous days. On this subject, it will be of interest to quote the following from Ruskin's *Stones of Venice* (vol. ii. pp. 4, 5): 'The Venice of modern fiction and drama is a thing of yesterday, a mere efflorescence of decay, a stage-dream, which the first ray of daylight must dissipate into dust. No prisoner whose name is worth remembering, or whose sorrows deserved sympathy, ever crossed that "Bridge of Sighs," which is the centre of the Byronic ideal of Venice; no great merchant of Venice ever saw that Rialto, under which the traveller now passes with breathless interest.' Among the chief manufactories of V. are the glass-works, in which magnificent mirrors, artificial pearls, gems, coloured beads, &c. are made, and which employ 4500 people. Jewellery, especially chains of the precious metals, gold and silver stuffs, silks, laces, velvets, soap, earthenware, wax-candles, &c. are also manufactured; and sugar-refining and ship-building are carried on. The trade of V. has been steadily declining for several years. In 1862, 7777 vessels (including coasters), of 671,379 tons, entered and cleared the port; in 1865, the numbers were 6179 vessels, of 585,873 tons. More than half the quantity of goods imported were brought by British vessels, and consisted chiefly of colonial produce, coals, coffee, cotton, woollen, and linen yarns, and manufactured goods. The decline in the trade of V. being due more to the uncertain and unsatisfactory political state of the Venetian provinces, it may fairly be said that now when V. has been incorporated with Italy, and has entered on a new political career, her trade will revive. Pop. (1881) 129,445.

History.—Previously to the Roman conquest, we know almost nothing of the history of Venetia; but at the time when that event took place, we know that this region was inhabited by two nations, the Veneti and the Carni. The Veneti, from whom the district derived its name, occupied the tract between the Plavis (Piave) on the north, and the Athesis (Adige) on the south. The origin and affinities of this people are unknown, and almost the first thing ascertained concerning them is, that in the very earliest times of which we have any record, we find them a commercial rather than a warlike community, carrying on a trade in amber, which they brought from the shores of the Baltic, and sold to the merchants of Phœnicia and Greece. Under the Roman Empire, the province became opulent and

flourishing; and besides its capital, Aquileia, which rose to be one of the most prosperous cities in Italy, it contained also the powerful and wealthy provincial cities, Patavium (Padua) and Verona, and numerous important towns. But before the close of the empire, the early prosperity of this province was swept away by the Huns under Attila, who, in 452, razed Aquileia to the ground, and devastated the cities of Concordia, Altinum, Patavium, Vicentia, Verona, and other cities of the province. Many of the inhabitants of these cities, driven from their ruined homes, sought shelter in the marshy lagoons, in a position too miserable to provoke the ambition of the conquerors, and defended from invasion from the mainland by the wide tract of muddy shallows which intervened between it and the actual shore, and secured against attack by sea by the shallowness of the water and the intricacy of the sea-passages. Of the cluster of islands upon which ancient V. stood, the principal were Grado Bibione, Caorlo, Heraclia, Equilo, Torcello, Murano, Rialto, Malamocco, Pelestrina, Brondolo, San Nicolo, Chioggia (Piccola and Grande), Amiano, Constanziaco, Olivolo, and Spinalunga. To Rialto and to Malamocco, the refugees from Padua resorted. The name of the province they had left was afterwards transferred to the cluster of the islands of the lagoon—the new settlement being commonly known, at least as early as the 8th c., as Venezia, or as we have it, Venice. Protected by the peculiar position of the islands in which they had found refuge, the early settlers devoted themselves to the pursuits for which their situation offered the greatest facilities—fishing, and the manufacture of salt. Houses began to cluster thickly on the Rialto; and when, in 568, Padua was sacked by the Lombards, many of its inhabitants emigrated to that infant colony which their ancestors had helped to found. The first form of government of the island-commonwealth was republican, administered by a consular triumvirate; but in 457, the consuls were superseded by tribunes, who, elected annually, and varying in number at different times from one to twelve, administered the government for 240 years. But during this period, although the young republic progressed in wealth and population, it did little to increase its political importance. Society was divided into factions by the ambition of the rival tribunes, and variety of interests rendered united action in warfare impossible. With the purpose of remedying the many evils of the government, Cristofero, Patriarch of Grado, in 697, laid before the Arengo—the periodical convention of the whole adult male population—a scheme in which he proposed that the tribunes should abdicate sovereign power, and that a magistrate, with the title of Duke or Doge, in whom should be vested undivided authority in civic, ecclesiastical, and military matters, should be placed over them. The proposition was received with much favour, and the election to the office fell upon Paolo Luca Anafesto, who was invested by the Metropolitan with his insignia of office, a crown of gold and a sceptre of ivory, March 697. Anafesto remained at the head of affairs till his death in 717, and under his rule the position of the republic greatly improved. Civil discords were in great measure stilled, and the Venetian territory was increased by the acquisition of a strip of the mainland, obtained by treaty from the king of the Lombards. Under Orso, the third Doge (720—737), the Venetians entered upon that career of enterprise in which their prudence and their valour were always equally conspicuous, and which they continued to pursue to the last. In 735, the Lombards seized Ravenna, compelling the Exarch (q. v.) to seek shelter in the lagoon, and implore the republic to lend her aid in re-acquiring the lost territory. Still considering themselves as nominally subject to the eastern emperor, besides being anxious, in the interests of their commerce, of securing the alliance of Constantinople and of obtaining the freedom of the seas of the Eastern Empire, the Venetians supplied the required assistance, and re-instated the Exarch in his vice-royalty. The services of the Doge on this occasion were rewarded by the Byzantine court with the honorary title of Hypatos, or Imperial Consul. The common punishment among the Venetians for tyranny was putting out the eyes, and the reigns of several of the doges at this time are but periods of tyranny and excess on the part of the ruler, terminated by exoculation or assassination by the people. By a treaty concluded in 803 between Charlemagne and the Emperor of the East, it was stipulated that the maritime towns of Istria and Dalmatia should be considered an integral portion of the Eastern Empire. This stipulation was adhered to till the year 808, when the aggressive policy of Charlemagne, and of his son Pepin, now king of Italy, prompted Nicephorus, the Emperor of the East, to despatch a squadron to the Adriatic, and to seek the alliance of the Venetians; and as the latter perceived that they had much more to gain from the friendship of the court of Constantinople—the key to the rich waters of the East—than from that of Charlemagne, the alliance was soon cemented. War immediately broke out; and V. was invaded by King Pepin, who took a number of the islands without meeting any resistance—the inhabitants having all been transferred to the central island, Rialto. The French advanced to the island of Albiola, when, to their dismay, they found that the tide had been ebbing, and that their vessels were stranded in these shallows. The whole French squadron now fell an easy prey to the swift-moving galleys of the Venetians; and such of the enemy as escaped being drowned, were massacred by the relentless islanders (809). This struggle, called the battle of Albiola, was conducted on the part of the republic by Angelo Badoer, tribune of the island of Rialto, who was raised to the rank of Doge, and transferred the seat of government to Rialto—the island of Heraclia and others having previously enjoyed that honour. In his reign also, connection was established between Rialto and all the circumjacent islands, by means of wooden bridges, and the cluster thus united now formally took the name Venezia (Venice), although it commonly received that name early in the previous century. The year 829 is memorable as that in which, according to tradition, the body of St Mark was transferred to V. from Alexandria. 'That the Venetians possessed themselves of his body in the 9th c., there appears,' says Ruskin, 'no sufficient reason to doubt;' and however we may regard this story, it cannot be denied that the belief in it by the Venetians and others attracted crowds of pious pilgrims to Rialto, and thus increased the traffic and prestige of the port; while the Venetians adopted St Mark as their patron saint; and their war-cry, 'Viva San Marco!' inspired their courage in many a fight, both on sea and land. For many years after this date, the history of V. is marked by no event of special note; but the naval importance, the commerce, and wealth, and refinement of the republic, increased year by year. Doge Orseolo II. (991—1008) greatly extended the trade of the republic by establishing commercial relations between it and the empires both of the East and West, the Crimea, Syria, Egypt, Tartary, Tunis, &c.; and under his rule, the territory of V., which, until lately, comprised only the islands of the lagoon, and a narrow

slip of territory on the mainland, was increased by further acquisitions on the mainland, and by the addition of the sea-boards of Dalmatia and Istria, which he annexed in 998. In 1085 the provinces of Dalmatia and Croatia were formally ceded to V. by the Emperor of the East; and at the same time the emperor exempted the Venetian traders in all parts of the empire, excepting in Cyprus, Candia, and Megalopolis, from all duties and imposts whatever. In 1099, V. sent forth a fleet of 207 vessels of all sail to the succour of Godfrey de Bouillon and his companions of the First Crusade. The defeat of a hostile Pisan fleet employed by the eastern Emperor, Alexius Comnenus, and the capture of 20 of the vessels, and the obtaining of the body of St Nicholas at the island of Myra, were the chief incidents of this expedition, which partook more of the nature of a predatory cruise than of a pilgrimage and crusade. But it is noticeable that in all the cases in which V. joined the Crusaders, the chief motive seems rather to have been to monopolise the maritime department of all these movements, and to extend her commercial relations, than to secure the Holy Sepulchre in Christian possession. The great fires of 1106, which, besides destroying the island city of Malamocco, reduced 30 churches and vast numbers of private dwellings in V. to ashes, were indirectly the cause of great improvements in the architecture of the city; for previously to this event, the dwellings of the Venetians were almost all built of wood; but after it, the material used was always either stone or marble obtained from Italy, Istria, or Dalmatia, in all of which it is found in abundance. In 1111, the Doge Faliero sent forth 100 galleys to aid Baldwin I., the successor of Godfrey de Bouillon, in the conquest of such Syrian ports as remained in the hands of the Mussulmans; and for the assistance thus rendered, the Venetians obtained the right to hold in possession a church, street, mill, bakery, bath, &c., and to be represented by a local magistrate in each of the oriental possessions of Christendom—rights of the very greatest importance to a trading community. In 1123, a fleet sent to succour the Christians in Palestine, and led by the Doge Michieli, distinguished itself by gaining a magnificent victory over an Egyptian fleet, and by the capture of ten Turkish galleons richly freighted. In the same year, the Venetians and their allies, the Christians in Palestine, reduced the almost impregnable city of Tyre, after a siege of four and a half months. In 1122, a decree was passed by Johannes Comnenus, the Eastern emperor, commanding the Venetian residents at Constantinople and the other Greek ports to quit the imperial dominions, and declaring the suspension of all intercourse between the two powers. The islanders thus saw the most profitable branch of their commerce threatened with extinction; and, resolved to make reprisals, they launched a fleet in 1123, and in that and the following year, they inflicted a terrible punishment on the empire, capturing Rhodes, and investing and sacking Andros, Samos, &c., all the Ionian islands, a portion of the Peloponnesus, &c. Further, this brilliant expedition was not brought to a close until all the Dalmatian fiefs, stirred to insurrection by Stephen, king of Hungary, were again reduced to submission. The Venetians were prominent members of the League of Lombardy against the German emperor; and in 1177, won a splendid victory over the Ghibellines, headed by Otho, son of Frederick Barbarossa, in defence of Pope Alexander III., who had appealed for protection to the republic. Otho's squadron numbered 75 sail, chiefly drawn from the ports of Genoa and Ancona; the Venetian force consisted of 34 large galleys; and the victory they gained influenced the pope to shew his gratitude by presenting the Doge Ziani with a ring, with which he commanded him to wed the Adriatic, that posterity might know that the sea was subject to V. 'as a bride is to her husband;' and it is recorded that in this year the pompous ceremony of the 'marriage' was celebrated for the first time. The result of the naval battle of Saboro was that Frederick agreed to a congress, which took place at Venice in 1177. On the occasion of this congress, when the pope, the Doge, and other dignitaries were assembled in the palace of St Mark's, Frederick approaching the throne on which Alexander III. was sitting, and prostrating himself, allowed the pope to plant his foot upon his neck. The congress of V. restored peace between the empire and Lombardy and Sicily. The Doge Ziani died in 1178. He did much to improve the architecture of the city, especially of the Square of St Mark. Of the three lofty red granite pillars which he is believed to have brought from the island of Scio, two adorn the portico of St Mark's—the third fell overboard and was lost in the attempt to land it. In October 1202, the expedition known as the Fourth Crusade set out from V., in Venetian vessels, under the command of the venerable Doge, Arrigo Dandolo: it did not, however, reach Palestine, but directed its force against the Byzantine Empire, which fell into the hands of the so-called Crusaders, April 1204. See Dandolo. On the division of the conquests of this expedition, V. received the Morea, the Illyric Isles, a large portion of Thessaly, the Sporades, the Cyclades, the cities of Adrianople, Trajanople, Dedymotichos, and Durazzo, the province of Servia, and the coasts of the Hellespont. A fourth part of Constantinople was set apart as a quarter where the Venetians might reside, under the protection of their own laws; and all restrictions as to trade were abolished. V. was now in possession of the fairest portions of the Lower Empire, and she had long been undisputed mistress of the seas. As she increased in power, she also increased in magnificence; and her nobles, having no lands in which they might employ their wealth, lavished immense sums upon their palaces, their pictures, decorations, and costly garments. Her palaces were decorated with the treasures and spoils of the East, and a school of artists arose, who found noble subjects for their pencils in the deeds of Faliero, Polani, Ziani, and the Dandoli. Her noblemen were now the most opulent in Europe, and travel and refinement had made them also the most polished. The most notable events in the history of V. during the 13th c. are her wars with Genoa, in which her hitherto unfailing good fortune deserted her, and the star of Dandolo succumbed to that of Doria at the desperate battle of Corzuola, from which conflict the Venetians could only retire with 12 out of 96 of their galleys, the others being taken or burned; the truce effected between V. and Palæologus, the Emperor of the East, in 1268; the electoral reforms by which, after a complex and often repeated process of election and reduction by lot, the forty-one members were chosen who formed the Electoral College, and of whom it was necessary that the Doge-elect should obtain at least the votes of twenty-five. In 1289, the inquisition was formally established in V., but this institution was rendered subject to so many limitations by the government of the republic, that it remained comparatively harmless. In 1310, a conspiracy was formed for the correction of abuses that had crept into the constitution, and for the punishment of actual and fancied crimes. Among the conspirators were members of many of the noblest families of Venice. This conspiracy, known as the Quirini-Tiepolo conspiracy, proved abortive; but among

other reforms to which it gave rise was the formation of the famous Council of Ten, who caused themselves to be declared a permanent assembly in 1335. In 1343, Andrea Dandolo, born in the year of the Quirini-Tiepolo conspiracy, a most accomplished scholar and statesman, was raised to the Dogate. His *Venetian Annals*, remarkable for their precision and accuracy, place their author in the first rank of medieval historians. In 1348, the lagoon was visited by an earthquake, accompanied by unusually high and destructive tides. These misfortunes were followed in the same year by a most frightful visitation of plague; and in the course of the six or seven months during which the epidemic raged, two-fifths of the population of the city perished, and fifty patrician families became extinct. The middle of the 14th c. is remarkable for the famous conspiracy headed by the Doge Marino Faliero (see FALIERI), and for a war with Hungary, in which V. lost Dalmatia. The commercial rivalry of V. and Genoa in the East led to a war in 1352, in which the Venetians were defeated (February 13, 1352) by Paganino Doria in the straits of the Bosporus; and though they recovered their lost laurels in a battle (August 29, 1353) off the Sardinian coast, their fleet was totally destroyed by Doria, in the Gulf of Sapienza, November 3, 1354, and they were forced to make peace in the following May. In 1378, the Venetians interfered in the quarrel between the Genoese and Cypriots, and their fleet vanquished that of the Genoese before Antium (July), in revenge for which the Venetian fleet was almost annihilated off Pola (May 1379), and Pietro Doria, advancing upon V. itself, seized the island of Chioggia. But the courage of the Venetians was nothing weakened by their dreadful reverses, and they soon changed the aspect of affairs by becoming in turn the besiegers themselves, blockading the enemy in Chioggia, and, after reducing him to the brink of starvation, accepting an unconditional surrender, June 1380. In 1396, Genoa, the oldest and most harassing foe of the republic, ceased to have separate existence as an enemy, for in that year she placed herself under the dominion of the king of France, an arrangement which afforded immeasurable relief to V., because, for several reasons, there was now much less chance of a rupture between the two maritime powers. For a number of years after this event, V. experienced the highest prosperity: a prodigious impulse was given to her trade; her argosies traversed every arm of the ocean; intimate intercourse was kept up with every European country, as well as with Syria, Egypt, and even India; and important articles of Venetian merchandise were the iron of Staffordshire, the tin of Cornwall and Devon, and the wool of Sussex. But no less beneficent than the effects of peace were those of the war which soon broke out between Novello, Lord of Padua, and Venice. At the conclusion of this war (1407), V. found herself in the possession of an empire on the mainland of Italy, the smallest communal section of which equalled their ancient island domain, and of which the principal cities were Vicenza, Verona, Padua, Feltre, and Belluno. With the death of the Doge Mocenigo in 1423, a new era in the existence of V. commences, for now 'the central epoch of her life was past, the decay had already begun.' During the next thirty years, war was continually waged, chiefly against the Dukes of Milan, in the course of which V., taking into pay Carmagnola (q. v.) and his bands, achieved many a splendid victory, and suffered many a disastrous defeat; and though, on the return of peace (1455), the territory of the republic was materially increased, by the acquisition of Brescia, Bergamo, Treviso, &c. on the mainland, this territory was obtained only after a struggle, enormously expensive in life and treasure, and during the continuance of which the commerce of V.—the well-spring of its prosperity at all times—began to decline. Mocenigo's last advice to the senate was to avoid war, which was certain to bring destruction on the country, and to prosecute industriously their trade and commerce, and cultivate the arts of peace. The rejection of this advice, combined with the narrow-minded selfish policy always pursued by the Venetians in the contests among the Italian states, was the prominent cause of its decline. The same fatal warlike policy was pursued throughout the 15th c.; and the whole of the 16th c. was employed by them in repairing the disasters which the league of Cambrai had brought upon them. Her policy in the 17th c. was to aid the opponents of her most dangerous neighbour, Austria, by recognising Henry IV. of France, aiding Bethlem Gabor and Ragotski, the Duke of Savoy against Spain, and the Protestants against the Catholics of the Grisons. From 1646 to 1669, war was carried on between the Venetians and Turks, the latter being, in almost every encounter, severely defeated; though, from the disproportionate strength of the antagonists, they ultimately gained Candia, the object of the war. The discovery of the Cape of Good Hope by the Portuguese in 1486, opened up to that nation an ocean-route to India, which was taken advantage of by Vasco da Gama, who rounded the Cape on his voyage from Lisbon to Calicut in 1497. The carrying-trade of the world was now no longer, as it had been, in the hands of the Venetians; and the vast commercial activity which sprang up among the western nations of Europe upon the discovery of America, clearly shewed that the naval superiority of the republic had for ever disappeared. But even in spite of these changes of fortune, V. might still have maintained a respectable mediocrity among maritime states, but for the character of her government, which was conducted by an exclusive oligarchy, in whose hands alone all power and freedom were vested. Long prior to the invasion of the republic by Napoleon in 1796, V. had become worn out and corrupted; the government of the Council of Ten had become a reign of terror; its nobles shewed vigour only in the pursuit of pleasure; its peasants, inured to peace, were unequal to war—all the ancient virtue, valour, and hardihood, which had raised a colony of fishermen, 'perched like sea-fowl' on a muddy shoal, to be a nation of the first rank, had died out of the state. Napoleon forced V. to break the neutrality which it meant to maintain in 1796, destroyed its government, and ceded the province to Austria by the treaty of Campo-Formio (q. v.). In 1806, the city of V., with the territory of Venetia, was annexed to the kingdom of Italy by the treaty of Presburg (q. v.); but it was transferred to Austria in 1814. In 1866, the city and territory were ceded to and incorporated with the Kingdom of Italy.

VENETIA, TERRITORY OF, ceded to Austria in 1815 (see VENICE, HISTORY OF), formed from that year, along with Lombardy (q. v.), what was called the Lombardo-Venetian Kingdom, one of the Austrian crownlands. In 1859, Lombardy was ceded to Italy, but Venetia continued in the possession of the Austrians till 1866, when, as one of the results of the famous 'Month's War,' it also was ceded to Italy, and incorporated with that kingdom. While still in Austrian possession, Venetia was regarded as bounded on the N. by the Austrian crownlands of the Tyrol and Carinthia; on the E. by Görz and Gradisca; on the S. by the Adriatic Sea, the river Po, and the Duchy of Modena; and

on the W. by the river Adige and the Tyrol. Area, 9224 sq. m.; pop. (1870) 2,718,633. The territory of V., ceded to Italy by the treaty of peace, October 3, 1866, has the same frontiers which it had as an Austrian province.

VE'NI CREA'TOR SPI'RITUS, an ancient and very celebrated hymn of the Roman Breviary, which occurs in the offices of the Feast of Pentecost, and which is used in many of the most solemn services of the Roman Catholic Church. Its author is not known with certainty. On the authority of an ancient life of Notker, it is ascribed to Charlemagne; and Daniel, in his *Thesaurus Hymnologicus*, adopts this opinion; but it seems to be certainly older than the age of Charlemagne; and its correct classical metre, as well as the purity of its language, bespeak an earlier and purer age. Mone makes it highly probable, by intrinsic evidence, that it is the composition of Pope Gregory I. The Veni Creator Spiritus must not be confounded with another hymn to the Holy Ghost, Veni Sancte Spiritus, which somewhat resembles it. The latter belongs not to the Breviary, but to the Missal, in which it forms a 'Sequence' in the Mass of Pentecost Sunday and Octave. The latter hymn is not in classical metre, but in rhyme; and its language is plainly of a lower age. The author of the Veni Sancte Spiritus is believed to be King Robert of France, to whom several other hymns of the same class are attributed.

VENLO', a small but strongly fortified town in the Netherlands, province of Limburg, is situated on the right bank of the Maas, 45 miles north-north-east of Maastricht, and has a safe little haven. The fortifications are very irregular, consisting of a main wall, canal, outworks, three powder-magazines, &c. The town is well built, and stands on elevated ground, surrounded by morasses. Principal buildings are the town-house, the great arsenal, the church of St Martin, &c. V. has good schools and several charitable institutions. The population is about 10,000. The Roman Catholics number about 7500; the remainder, except about 100 Jews, being Protestants.

The principal means of living is trade with Germany in coal, stone, lime, iron, bricks, grain, &c.; besides stone-hewing, tanning leather, dyeing, grinding corn, beer-brewing, making cigars, starch, vinegar, chocolate, Venlo pepper-cake, &c.

V. was walled by Duke Reynold of Gelder in 1343. It has many a time felt the horrors of a siege, and been taken and retaken, the last time by the Belgians in 1830, in whose hands it remained till the Conference of London, June 22, 1839, when it returned to the Dutch.

VENN, Rev. Henry, a pious 'evangelical' clergyman of the English Church, was born at Barnes in Surrey in 1725. Having studied and entered into holy orders—in this respect following the example of his paternal ancestors since the Reformation—he was shortly after appointed curate of Clapham. In 1759, he resigned his curacy, to become vicar of Huddersfield in Yorkshire, which he left in 1769, on being presented to the rectory of Yelling in Huntingdonshire. He died in the house of his son, John Venn, rector of Clapham, in June 1797. The memory of his pure life, good example, and earnest preaching was cherished for many years after his death in the places which had benefited by his ministration; and his name is associated with those of John Newton, Thomas Scott, Charles Simeon, and others, as having had considerable influence on the evangelical movement in the Church of England. V. was the author of a book entitled *The Complete Duty of Man*, a sort of development or extension of the *Whole Duty of Man*. His *Life and Correspondence* was published by his grandson, Henry Venn, in 1839.

VE'NOMOUS BITES AND STINGS. Under this title are considered all wounds inflicted by animals which by their bites or stings introduce poisonous or irritating matter into the bodies of their victims. In this country, the subject is of comparatively little importance, since it is very seldom that the bite of our most venomous animal —the adder—is fatal; but in warmer countries, it demands the serious attention of the surgeon. Following Mr Busk, in his article on 'Venomous Insects and Reptiles,' in Holmes's *System of Surgery*, we shall briefly enumerate the most venomous animals found (1) amongst the invertebrata, and (2) amongst the vertebrata.

(1.) Amongst the invertebrata, the most formidable poisonous animals are to be found in the classes *Arachnida*, *Myriapoda*, and *Insecta*. The *Scorpions* are characterised by a prolonged jointed abdomen, terminating in a hooked claw, which is perforated, and connected at the base with poison-glands. The larger species, which are restricted to hot countries, by their sting give rise to symptoms of great severity, and occasionally cause death. 'The symptoms resemble those produced by the stings of wasps and bees in an aggravated degree, such as acute pain, a general nervous shock, attended with numbness, vertigo, occasionally temporary loss of sight, vomiting, &c.; while the local symptoms are swelling, and other signs of acute inflammation, followed, in many cases, by suppuration, sloughing, and their consequences. The remedy which appears to have obtained the greatest repute, is the application of ammonia externally, and its internal administration as a stimulant also; although it is probable that any other diffusible stimulus, combined with opiates, would be equally, if not more efficacious.'—Busk, *op. cit.*, p. 921. Several species of *Scolopendra*, or *Centipedes*, are regarded as highly venomous, and there is no doubt that the bites of some of the larger kinds inhabiting hot countries (especially of *S. morsitans*), give rise to excessively painful consequences, although less severe than those occasioned by the sting of the scorpion. In these animals, the poison is introduced not by a caudal sting, but by perforated curved fangs, connected with the mandibles, where poison-glands doubtless exist, though their existence has not been clearly established on anatomical evidence. Although *Spiders* have long had a bad reputation for their venomous bites, it is very uncertain whether (with one or two more or less problematical exceptions) their bite inflicts more than a simple wound. The most infamous of the spiders is the Tarantula or Tarentula (*Lycosa tarentula*), a citigrade or running spider, common in South Italy. See TARANTISM. Direct experiments, however, shew that the bite of this spider merely causes a slight local irritation. There is a spider inhabiting the island of Elba (*Aranea 13-guttata*) which is said to inflict a dangerous and fatal bite upon man and domestic animals; while the cork-forests of Morocco are said to be infested by an equally formidable spider, which is there known as the *Tendevaman*. It would be well if scientific travellers in those countries would obtain more definite information regarding these spiders. Amongst insects, many inflict more or less troublesome bites, while a comparatively few (and those almost, if not altogether restricted to the order *Hymenoptera*) inflict serious injury by their stings.

In the case of the majority of biting insects, it is very doubtful whether the local discomfort is due to the introduction of poison, or is the consequence of the prolonged mechanical irritation only.

In some cases, as in the ants, we know that formic acid (an irritant of great power) is introduced; and considering the prolonged irritation that follows the bites of many small insects, it is probable that there is some special acrid matter in their salivary secretion. This view is further borne out by the fact, that persons who suffer much from the bites of fleas and bugs (and the degree of annoyance varies extremely in different persons), are relieved by the local application of hartshorn, or some other preparation of ammonia. The 'Tsetse' (*Glossinia morsitans*), whose ravages are so graphically described by Dr Livingstone, does not attack man, but it affords an example of an insect, very little larger than a house-fly, being able to secrete an intense septic poison, which, introduced by its bites, causes certain death to cattle, the sheep, horse, and dog, while it is innocuous not only to man but to the goat, antelope, ass, and pig, to all wild animals, and to the calf until it is weaned. Another insect, mentioned but not described by the same traveller, produces by its bite vomiting and purging in man. In the case of stinging insects, the stinging instrument consists essentially of two fine and sharp darts, enclosed in a tubular sheath, at the base of which is a poison-sac, whose contents are injected into the wound made by the darts, which are usually serrated or barbed. The consequences of the sting of a bee or wasp are too familiar to require any detailed notice; and the sting of the hornet, a much rarer insect, is of the same nature, but of an aggravated form. The sting of a bee or wasp scarcely ever proves fatal, except the insect is swallowed in a cavity in ripe fruit, or in the act of drinking, and inflicts its sting on the throat. A sting in the fauces usually excites severe and diffuse inflammation, which may extend to the glottis, and thus cause suffocation. The treatment must be prompt, and consist of scarification internally, leeches externally, and possibly tracheotomy. When a large number of any of these insects make a combined attack, the result may be fatal. For the bites and stings of all these animals, the remedy recommended for scorpion-stings must be used; namely, ammonia in some form or other, and probably sal-volatile is the best. Amongst various domestic remedies for allaying the irritation excited by these stings, are vinegar, oil, spirits, Eau-de-Cologne, the blue-ball employed by washerwomen, consisting of indigo, &c. If possible, the sting should be extracted by bringing it to view by pressure over the wound with a watch-key, and then seizing it by small forceps.


Tsetse (*Glossinia morsitans*).

(2) Among the vertebrata, the only animals capable of inflicting poisoned wounds are the ophidian reptiles or snakes. As the description of the mechanism of the poison-fangs of venomous snakes is sufficiently given in the article SERPENTS, we may pass on to the subject of the nature of the *venom* and its effects. The venom is described, when fresh, as a transparent, yellowish or greenish, somewhat viscid, neutral fluid, much resembling saliva in its physical character, and exhibiting no obvious indication of its virulent nature. According to Prince Lucien Bonaparte, it contains, in addition to albuminous or mucous and fatty matters and the usual salts, a peculiar principle, to which he has given the name *echidnine* or *viperine*, which appears to be the active poisonous matter. The poison of the most deadly serpent produces no effect when introduced into the stomachs of living animals, excepting a slight irritation of the air-passages; nor is its effect more serious when applied to the surface of the skin, even when it has been slightly abraded. From the experiments of Fontana 'on the poison of the viper,' and other observers, it seems that the venom must be introduced directly into the subcutaneous cellular tissue. When, however, properly introduced, as through its natural channel, the poison-fang, 'its effects are very rapidly manifested; in fact, in some cases so rapidly as more to resemble those of prussic acid than anything else; usually, however, a brief interval elapses before the effects are shewn. These may be divided into general and local. The first symptoms in nearly all cases appear to be a general shock to the nervous system, attended with faintness, tremor, and great depression, sometimes with stupor, loss of sight, vomiting, lockjaw, and general insensibility; at the same time, great and sometimes intense local pain is set up. The limb, if the wound is in one of the extremities, rapidly swells. In severe cases, the swelling continues to spread till it reaches the trunk, or even the entire body, whose surface assumes a jaundiced hue. The gravity of the effects of the bite of a venomous snake appears to be in direct ratio to the comparative sizes of the snake and its victim, and also to the quantity of the poisonous secretion present at the time in the saccular gland. It is also greatly governed by the situation of the wound; one on an extremity, for example, being far less dangerous than one on the face or trunk. It has been remarked that two or more wounds at distant points are more rapidly effective than when they are inflicted on one spot.'—Busk, *op. cit.*, pp. 926, 927. The poison is one which seems to act primarily on the nervous system, and also to have a septic action on the tissues with which it is brought in contact; and in order to produce its effects, it must be directly introduced into the circulation.

The viper is the only poisonous snake in this country; but in other countries, there are many snakes whose bite is often fatal. America possesses the rattlesnake; the East Indies, the cobra da capello, the phorza-snake, &c.; and Africa and Australia are rich in poisonous reptiles. The bite of the viper presents in a mild form the typical symptoms which have been described, and, except perhaps to children, is very seldom fatal. In the case of many snake-bites, however, rapid death is the general result; and should recovery take place, it will often be very protracted and imperfect.

The symptoms produced by the bites of different kinds of venomous serpents differ considerably in character as well as in intensity, although there is a general resemblance.

The treatment may be divided into local and general. The local treatment consists in the *immediate* application of a ligature above the wound—provided the situation of the latter allow of it—to prevent absorption, and the excision of the bitten part, and then, after bathing it with warm water, sucking it, or, better, applying an exhausted cupping-glass over it. When the position of the bite prevents free excision, the poisoned tissues must be destroyed by *Liquor Ammoniæ*, or nitric acid. The general or constitutional measures consist essentially in the very free administration of the most powerful diffusible stimulants, such as hot strong brandy or whisky and water, and ammonia (an ammoniacal preparation, known as *Eau de Luce*, is a popular remedy for snake-bites). In these cases, in consequence of the prostration of the patient, he can bear an extraordinary quantity of stimulants. For the bite of the rattlesnake, the popular treatment is to make the patient drunk—a process

known as the *Western Cure.* Olive oil, freely administered, has been strongly advocated. We append in a foot-note* a few of the so-called specific remedies said to be adopted by the inhabitants of countries where the most virulent serpents abound.

VENO'SA (anc. *Venusia*), a town of Southern Italy, in the province of Basilicata, 100 miles east-north-east of Naples. Its castle, which gives a picturesque effect to the quarter in which it is placed, is now in ruins. The Norman abbey of the Holy Trinity, founded by the Norman, Robert Guiscard, and consecrated in 1059, though now in ruins, is imposing from its magnitude and regularity, as well as interesting from its antiquity. But the unfailing interest of V. arises from its being the birthplace of Horace (q. v.). In one of the streets is a column surmounted by the bust of the poet; and many of the localities of the vicinity can be identified with the places he has immortalised. Pop. about 7000.

VENT, or TOUCH-HOLE. See GUN.

VENTILATION. See WARMING AND VENTILATION.

VENTIMI'GLIA, a small fortified town of Northern Italy, in the province of Porto Maurizio, stands on a promontory on the sea-shore, 18 miles east of Nice. Besides an old cathedral, it contains the church of St Michel, containing two Roman milestones, and inscriptions by Augustus and Antoninus Pius. The strongly fortified castle above the town, recently repaired and strengthened, is the chief stronghold between Genoa and Nice. Wines and fruits are produced. V., the ancient *Albium Intermelium*, was the capital of the Intermelians, a Ligurian tribe; and its possession was contested in the middle ages by the Genoese, the counts of Provence, and the dukes of Savoy. Pop. 6256.

VE'NTNOR, the principal town on the south shore of the Isle of Wight, 10 miles south-south-east of Newport. It is situated amid the finest of the fine scenery of the Undercliff. Fossils are found in great quantity in the vicinity. With a fine southern exposure, and well sheltered from the north, V. possesses a mild climate, suitable for various classes of invalids, and has accordingly become a favourite winter and spring resort. The town is well provided with hotels and lodging-houses. Its beach is composed of beautiful yellow shingle. With these and other recommendations, V. has risen into importance within the last 30 years. Pop. (1861) 3208; (1871) 4841; (1881) 5493.

VENTRI'CULITES, a genus of fossil sponges, specimens of which are of frequent occurrence in cretaceous strata. They often form the nucleus around which flints are aggregated, and give their form to the flint-nodules. Indeed, it is believed by some that the flints are the metamorphosed remains of this genus, and other silicious sponges. Ventriculites are sessile, and cup-shaped, gradually opening from the base upwards. Twelve species have been observed.

VENTRI'LOQUISM, the art of producing tones and words without any motion of the mouth, and so that the hearer is induced to refer the sound to some other place. It does not depend on any peculiar structure of the organs of voice, but upon practice and dexterity. The name is founded upon the mistaken supposition that the voice proceeds from the belly. The art of the ventriloquist consists mainly in taking a deep inhalation of breath, and then allowing it to escape slowly; the sounds of the voice being modified and muffled by means of the muscles of the upper part of the throat and of the palate. The ventriloquist avails himself at the same time of means such as are employed by sleight-of-hand performers to mislead the attention. Ventriloquism is a very ancient art; and is mentioned by Isaiah (xxix. 4). The Greeks ascribed it to the operation of demons, and called ventriloquists *Engastrimanteis* (belly-seers), and also *Euryklytes*, from Eurykles, a professor of the art at Athens. In modern times, a Frenchman of the name of Alexandre obtained great reputation for his mimetic representations, combined with ventriloquism and sleight-of-hand; and in England, Love was long one of the most popular ventriloquists.

VE'NUE is the locality assigned in pleadings in English actions at law for the acts or circumstances out of which the action arises. The rule is, that the declaration or plaintiff's pleading must set forth some venue, which is usually the county where the cause of action arose; and this shews where the trial will take place, if at all. If the other party shews that it would be more convenient and less expensive to try the action elsewhere, then he may apply to the court, or a judge, to change the venue, and thus the trial may take place in a different county from that first stated.

VE'NUS, the Roman goddess of Love, subsequently identified with the Greek Aphrodite (q.v.). Originally, she does not seem to have occupied a conspicuous place in the Latin religion, and scarcely, if at all, figures in the history of Rome under the kings; a circumstance that throws no inconsiderable light on the Roman character, for it may be taken as an indication of the grave and serious disposition of the people, who highly valued matrimony and wedded joys, but cared little for the sentimental passion of love. Gradually, however, as the myth of the Trojan origin of Rome gained ground, the worship of V. emerged into importance. Aphrodite was the mother of Æneas, and Aphrodite became V.; Ares was Mars, and Mars was the national god of the Roman people; and as in the Greek mythology, Aphrodite was beloved of Ares, so, of course, V. was represented as the paramour of Mars, and thus was advanced by the poets to the dignity of the divine mother of the Roman people. Several temples were erected to her in Rome at different times and under different names, and rites were celebrated in her honour during the month of April—the spring-time of the year being thought favourable to the growth of tender emotions.

Venus of Canova.

The figure of V. was a favourite subject of ancient sculptors. One of the most famous specimens extant is the VENUS DE MEDICI, preserved in the Uffizi Gallery at Florence, and generally admitted to be the finest relic of ancient art. It was dug up in several pieces, either at the villa of Hadrian, near Tivoli, or at the portico of Octavia, in Rome, in the 17th c.; and after remaining for some time in the Medici Palace in Rome (whence its name), was carried to Florence by Cosmo III., about 1680. It is a nude statue, 4 feet 11½ inches in height, without the plinth; and from the exquisite symmetry and grace of the figure, it has become a sort of standard of excellence for the female form. The

* Decoction of Virginian snake-root; *Radix corineæ;* guaco, or the *Sacra vitæ anchora;* the Tanjore Pill, whose chief ingredient is arsenic. See the article SNAKE STONES.

right arm, and the lower half of the left arm, and a few piecings here and there, are modern. The plinth (also modern) bears an inscription copied from the old one, stating that the statue is the work of Cleomenes, the Athenian, son of Apollodorus, who flourished 200—150 B. C.

VENUS. See VENERIDÆ.

VE'NUSBERG, the name of several mountains in Germany, especially in Swabia; it appears to be met with in Italy also. It occurs for the first time, so far as is known, in a poem called the *Children of Limburg* composed in the Netherlands about 1337 (published by Van den Bergh, Leyden, 1846); but since then it is met with frequently in the literature of the 15th and 16th centuries, and has been preserved to the present day in legends and popular songs. According to these accounts, the Lady Venus holds her court in the interior of such mountains, in brilliant style, with song and dance, banquets, and all kinds of revels. Persons of earthly mould now and then visit her abode (they are always represented as *descending*), and tarry longer or shorter time, some even to the Day of Judgment, leading a life of perpetual delight; e. g., Heinrich von Limburg, a hero of the above-mentioned romance, and the noble Tannhäuser (q. v.). Yet they usually run the risk of eternal perdition; and therefore the faithful Eckhart sits before the entrance of the mountain, and warns people against entering. Nor does the condition of the sojourners always present so enticing an aspect; on the contrary, there are at times heard issuing from the mountain the lamentations of the damned; and Geiler von Keisersberg makes the witches in their night-expeditions rendezvous in the Venusberg. On putting together the various traits of these traditions, it is apparent that they originated in the mythology of the highest German antiquity. The Lady Venus is, under a name borrowed from the classical mythology, the universal Divine Mother of the old German belief, in her peculiar conception of Subterranean Goddess—the same being that appears under several other German names, each bringing forward some particular side of her character; e. g., Hulda (q. v.), the Gracious, Benign; Hilda, War; Berchta (q. v.), the Shining; Hel, the Concealed (from which our Hell is derived). In this character of goddess of the under-world, she is surrounded by the elves and other subterranean spirits, unbaptised children, fallen heroes, and the wise women devoted to her services, who, in the way of thinking of later times, were degraded to witches. The queen of Elfland, or Faery, is evidently only another form of the Lady Venus modified by a more decided mixture of Celtic and classic elements.—See the Introduction to the Tale of Tamlane, and Thomas the Rhymer, in Scott's *Minstrelsy of the Scottish Border*.

VENUS'S FLY-TRAP. See DIONÆA.

VENUS'S LOOKING-GLASS (*Specularia speculum*), a very pretty little annual, of the natural order *Campanulaceæ*, which has long been a favourite in flower-gardens, and is a native of corn-fields in the south of Europe. It has brilliant blue, white, or violet-coloured flowers, which fold up in a pentagonal manner towards evening.

VE'RA CRUZ, or VILLA RICA DE LA VERA CRUZ (the Rich City of the Real Cross), an ancient city on the east coast of Mexico, about 185 miles east of the city of Mexico, with a pop. of about 8000, composed of a motley collection from many nations. The city is built in a semicircle facing the sea, and is regularly laid out; the streets, which are wider than is usual in tropical countries, running east and west from the harbour, with others crossing them at right angles. The town is well defended by a strong wall, and other substantial works, as also by the castle of St Juan de Ulloa, which stands upon an island of the same name, about half a mile from the shore. The principal buildings are the cathedral, and about 15 other churches, generally built in the Moorish style, only six of which are in use; several monasteries; the court-house and prison, which stand on one side of the great square in the centre of the city. The houses and public buildings are generally built of rubble masonry, formed of small stones, interspersed with red tiles, the whole being afterwards covered with good durable plaster, and coloured with a variety of tints; and as most of the houses are in the old Spanish style, with open arcades, balconies, galleries, &c., the city presents a very picturesque aspect. There are a few good hospitals. The drainage of the city flows down open channels in the centre of the streets, which are almost on a level with the sea. This, combined with the wretched water which the inhabitants are compelled to use, the marshy and utterly barren nature of the surrounding country, and the pestilential nature of the climate generally, easily accounts for the frightful ravages of yellow and other fevers. Yellow fever is most prevalent from May till November. Although it is the chief port for all Mexico, V. C. has no harbour, but only an open roadstead between the town and the castle. The anchorage is exceedingly bad, and when the north gales, or *Nortes* (terrible hurricanes, bearing along with them clouds of sand from the sand-hills behind the town), prevail, many vessels are wrecked on the adjoining shore. A railway has been constructed between this city and Mexico; tramways for covered cars have also been laid down through the principal street to the railway station, a distance of 2½ miles.

The chief exports are the precious metals, cochineal, sugar, flour, indigo, provisions, sarsaparilla, leather, vanilla, jalap, soap, logwood, and pimento; and the imports, cotton, woollen, linen, and silk goods, brandy, iron, steel, wax, quicksilver, paper, hardware and cutlery, earthenware, &c. The exports from Vera Cruz for 9 months ending Sept. 30 1868 were valued at $6,189,554, and were chiefly silver and gold coin. The exports to the United States in 1867—8 were valued at $488,306.

VERATRINE ($C_{32}H_{52}N_2O_8$), an alkaloid occurring in cevadilla (the dried fruit of *Asagræa officinalis*), in the bulbs of *Colchicum autumnale*, and in the roots and seeds of different species of *veratrum*. Cèvadilla is the source from which it is most readily obtained; and for the method of extracting it we must refer to the pharmacopœia. In a state of purity, it is a pale, gray, amorphous powder, without smell; but even in the most minute quantity, powerfully irritating to the nostrils, sometimes producing dangerous fits of sneezing. It is strongly and persistently bitter, and highly acrid; insoluble in water, sparingly soluble in spirit and ether, but readily in diluted acids. Heated with access of air, it melts into a yellow liquid, and at length burns away, leaving no residue. In France, it is much used as an internal remedy for pneumonia and acute rheumatism, and for the latter its efficacy is well established. It is given in the form of pills, containing $\frac{1}{24}$th of a grain, of which three may at first be given daily, and the number increased up to eight or ten, unless pain in the throat or stomach, vomiting, or diarrhœa supervene, when their use must be suspended till these symptoms disappear. In this country, it is chiefly employed externally in the form of 'ointment of veratria' for neuralgic affections, and for scrofulous

diseases of the joints. It is an extremely acrid and violent poison, and must be prescribed with great care.

VERA'TRUM. See HELLEBORE.

VERB (Lat. *verbum*, a word), the name given in Grammar to that part of speech (see PARTS OF SPEECH) which predicates or affirms. See SENTENCE. As the very end of speaking is to assert or affirm something with a view to being believed or disbelieved, the part of speech which performs this office is, as it were, the soul of the sentence, and is called 'the word,' or verb, par excellence. Verbs affirm either some action or some state; as, 'John *reads*;' 'The sun *shines*;' 'The book *lies* on the table.' When the nature of the action requires an object to complete the sense, the verb is called *Transitive*, because the action *passes over* (Lat. *transit*) to an object; as, 'The child strikes *the dog*.' Some verbs complete the conception of the action in themselves, and require no complement; as, 'The child *sleeps*,' 'The bird *flies*.' These are called *Intransitive*. A distinction is attempted to be made between intransitive verbs expressing action (as *flies*, *moves*), and verbs expressing merely a state (as *sleeps*, *lies*), the latter being called *neuter* verbs. But it is often impossible to draw the line where activity ends and neutrality begins. Even in such a verb as *sleeps*, it is implied that the sleeper shews certain outward manifestations that make an impression, or act, on the beholder; when we affirm that an object *stands*, *lies*, or even only *exists*, or *is*, we in fact affirm that it 'acts,' in this sense. All verbs, then, agree in affirming action.

Nor can any exact or permanent division be made of verbs into transitive and intransitive. We can say whether a given verb in a particular sentence is used transitively or intransitively; but not that it is absolutely, and in itself, transitive or intransitive. It would be difficult, perhaps, to find a verb that cannot be shewn to be both the one and the other. 'The child *sees* the candle,' is unquestionably an instance of a transitive verb; in, 'The new-born child *sees*, but the puppy is blind,' the same verb is unquestionably intransitive. A verb used transitively has reference to particular acts; when the action is to be *generalised*, all specification of an object is dropped, and the verb becomes intransitive. Ex., 'Men *build* houses' (trans.); 'Men *build*, and time pulls down' (intrans.).

Intransitive verbs generally express a kind of action that we think of, at least, as composed of a number of parts, all like each other; as, he *walks*, *runs*. Now, with regard to the particular parts, we generally find that the same verb takes an object after it; as, 'He walks *a step, a mile, a long way*;' 'John played *a stroke, a piece, a game*;' 'He did not sleep a *wink*' (sleep being a prolonged winking). That any intransitive verb can take its cognate noun as an object, is a received doctrine. Ex., 'He *ran* a *race*;' 'They *died* an easy *death*.'

There are two classes of transitive and intransitive verbs, related to each other, in the following way:

Intransitive.	Transitive.	
he sits.	he sets	(causes to sit).
" lies.	" lays	(" " lie).
" falls.	" fells	(" " fall).
" rises.	" raises	(" " rise).
" sucks.	" soaks	(" " suck).
" drinks.	" drenches	(" " drink).
" dives.	" dips	(" " dive).

Those in the second column are called *causative* verbs. In the ancient forms of our language, there were many more such causative verbs, formed from root-verbs by a change, generally of the vowel. In Hebrew, every verb is capable of assuming the causative form. Modern English does not stand much on forms, but employs almost any verb in a causative sense without change of any kind. Thus: 'The horse *walked*'—'the groom *walked* the horse;' 'The wood *floated*'—'raftsmen *floated* the wood down the stream.'

Passive Form, or Voice, of Verbs.—Instead of 'Cæsar *defeated* Pompey,' we may say, 'Pompey *was defeated* by Cæsar.' In the former, the verb is in the *active voice*; in the latter, in the *passive voice*. In using the passive voice, the thing or person acted upon is made the subject of the sentence, and has the chief attention directed thereto; with the active voice, the doer and his action are more prominent. Of course, it is only transitive verbs that can thus have a passive voice.

One class of intransitive verbs become transitive by the addition of one of the class of words called prepositions; as, *speak—speak to*; *fall—fall upon*. Some verbs already transitive take prepositions simply to modify the sense; as, *set—set up*, *break—break down*. In such cases, the verb and preposition are to be considered as forming one compound verb, and might be written with a hyphen—speak-to, break-down. With the addition of a preposition, what was an intransitive verb becomes capable of being used in the passive voice. Thus, 'The king spoke to the duke about it'—'the duke was spoken to about it by the king.' 'Robbers fell upon him'—'he was fallen upon by robbers.'

Not, however, in all cases. For, 'The Thames runs into the sea,' we could not say, 'The sea is run into by the Thames.' And yet, with this same verb, we can say, 'The mail-train was run into by the express.' The distinction seems to be, that when we think of the object as sensibly affected by the action, and wish to call the chief attention to the effect so produced, the object may become the subject, and the verb be passive.

VERBENA'CEÆ, a natural order of exogenous plants, consisting chiefly of trees and shrubs, but partly also of herbaceous plants. The leaves are generally opposite and simple, and have no stipules. The flowers are generally in corymbs or spikes; the calyx is tubular, persistent, inferior; the corolla hypogynous, tubular, its limb usually irregular; the stamens generally four, two long and two short, sometimes equal, sometimes only two; the ovary 2—4-celled, the style solitary, terminal; the fruit composed of 2—4 achœnia united, sometimes fleshy; the seeds 1—4. The order contains almost 800 known species, chiefly tropical, some of them natives of temperate countries. The V. are allied to *Labiatæ* both in botanical characters and in properties, but the leaves have no oil-glands. Some are beautiful ornaments of flower-gardens and hot-houses; some are highly esteemed for their fragrance; some are used in medicine, as Vervain (q. v.), &c., although no medicinal plant of much value belongs to the order; the fruit of some species, as *Premna esculenta* and species of *Lantana*, is eaten; the leaves of *Stachytarpheta Jamaicensis* are used as a substitute for tea; and the timber of a number of species is valuable. To this order belongs the Teak (q. v.) of India.

VERCE'LLI, a venerable city of Northern Italy, in the province of Novara, stands in a fertile plain, on the right bank of the Sesia, 44 miles west-south west of Milan by railway. It covers a wide area, is surrounded by boulevards—those on the north-west side commanding a magnificent view of the Alps—is the seat of a bishop, and has the appearance of great prosperity. The cathedral, an edifice of about the middle of the 16th c., has a library containing a collection of ancient and valuable MSS. V. is a thriving city. Pop. about 25,000.

VERDE-ANTIQUE, a beautiful stone of a dark green colour, with patches of white, and sometimes also black and red. It is a kind of hard breccia, and was much prized by the ancient Romans, and is still in great favour in Italy.

VERDI, GIUSEPPE, the only living operatic composer of any note in Italy. He was born in 1814 at Rancola, in the duchy of Parma, where his father was an innkeeper, and he received his musical education at Milan. His first work was a musical drama called *Oberto di San Bonifazio*, which appeared in 1839; and he has since produced a number of operas, including *I Lombardi*, *Ernani*, *I due Foscari*, *Attila*, *Macbeth*, *I Masnadieri*, *Luisa Miller*, *Nabucodonosor*, *Rigoletto*, *Il Trovatore*, *La Traviata*, and *Un ballo in Maschera*—some of which have attained a very high degree of popularity, not only in Italy, but in France, Germany, and England. V.'s operas, while they abound in taking melody and in striking dramatic effects, are characterised by noisy orchestration. His earlier works are unsatisfactory to the scientific musician, from their lack of contrapuntal skill; but in his later operas there is an improvement in this respect.

VE'RDICT, in Law, is the finding of a jury as to the issue of fact raised between the parties. The usual verdict in criminal cases is guilty or not guilty; in civil cases, it is a verdict for the plaintiff or for the defendant, according to the fact. These are called general verdicts. In some civil cases, the jury, when doubtful, or when the court directing them is doubtful how the law ought to be applied to the facts, find a special verdict, i.e., specific facts, leaving the court to draw the proper conclusion. A verdict by a jury is usually conclusive in all criminal cases, and no new trial can be had; but in civil cases, the party defeated may, within a certain number of days allowed by the practice of the court, move to set the verdict aside, and apply for a new trial on various grounds; as, for example, that the judge misdirected or misled the jury; that the verdict was against the weight of evidence, or was perverse; that the damages were too great, or too small, &c. See NOT PROVEN.

VE'RDIGRIS is the popular name for normal Acetate of Copper ($2C_2H_3O_2C_u + H_2O$), a substance which is largely used for commercial purposes, and as an external application in surgery. It is prepared on a large scale by piling up copper-plates with alternate layers of marc or fermenting grape-skins. In the course of a few weeks, the surface of the copper is covered with a crust of the salt, which is detached, made into a thick paste with vinegar, and pressed into moulds. The salt thus obtained is in the form of a bluish-green tough mass, which is not easily pulverised. The formation of the salt by this process is due to the alcohol in the grape-skins being slowly oxidised into acetic acid, while the copper absorbs oxygen from the air, and the oxide thus formed unites with the acetic acid. Verdigris may be obtained more directly by placing the copper sheets in cloths dipped in vinegar. Verdigris is permanent in the air; when heated, it first loses water, and then acetic acid, the residue being metallic copper. Water resolves it into an insoluble tribasic acetate, and a soluble subsesquiacetate of copper—a point which must be recollected in employing this salt. It is used by the surgeon as a caustic application to venereal warts and fungous growths; it is also a good application in ophthalmia tarsi, and has been of much service in stimulating old and indolent ulcers, in the ulcerated sore throat of scarlatina, and in malignant ulcer of the tongue. It may be used in the form of an ointment or a liniment. The latter, formerly known as *Mel Ægyptiacum*, is composed of 1 ounce of powdered verdigris, 7 ounces of vinegar, and 14 of honey. The verdigris is dissolved in the vinegar, and to the strained solution the honey is added, and the whole is boiled to a proper consistence. It should be applied with a camel-hair pencil.

Verdigris is an active irritant poison, but is much more commonly the source of accidental than intentional poisoning, it being often formed in copper vessels used for cooking, or in the very reprehensible practice of putting copper coins into pickles to give them a fine green colour. If copper vessels for cooking are kept perfectly clean, they seem not to be dangerous, provided (1) no acid matter be placed in them; (2) that the boiled materials are at once poured out, and not allowed to stand to cool in them; and (3) that the vessels are always at once cleaned. But the interior of such vessels should always be tinned, care being frequently taken that the tinning remains entire. In cases of poisoning, the best treatment consists in the free administration of white of eggs and milk.

VE'RDITER, a pigment which is extensively used in common painting. It is either blue or green, the latter being generally known as Bremen Green. It is formed by a very complicated process from blue vitriol, or sulphate of copper, sea-salt, metallic copper, muriatic acid, caustic potash, and water, and occupies three months in its manufacture. The blue is most valued.

VE'RDOY, in Heraldry, a term indicating that a bordure is charged with flowers, leaves, or vegetable charges. Thus, a bordure argent verdoy of oak-leaves proper is equivalent to a bordure argent, charged with eight oak-leaves proper.

VERDUN, a fortified town of France, in the dep. of Meuse, stands on the right bank of the river of that name, about 150 miles (direct line) east-north-east of Paris. It was fortified by Vauban, and its defences consist of a wall with bastions and a citadel. It is the seat of a bishop; and, besides the cathedral—containing a very beautiful altar—there are numerous churches. On November 8, 1870, the fortress capitulated to the Prussians, with 108 guns and 5000 prisoners. Pop. (1872) 9869.

VERGE, a medieval term for a small shaft.

VE'RGER (Lat. *virga*, a wand), an officer of cathedral and collegiate churches, who carries the mace, whether before the dean or other chief dignitary, in procession, or on any other ceremonial occasion. The mace, however, has no sacred significance, but is simply an emblem of dignity.

VE'RJUICE, a vinegar formerly much used, made from sour cider, or from the juice of the wild crab. The expressed juice of unripe grapes is another kind of verjuice used in the vine districts. Both are occasionally employed in cooking.

VERME'JO, an important affluent of the Paraguay (q. v.).

VE'RMÉS (Lat. worms), the name given by Linnæus to one of the classes in his zoological system, in which he included all the lower invertebrate animals, whether of worm-like form or not. The study of their structure has since led to their arrangement in several distinct classes, and the Linnæan term is altogether disused.

VERMICE'LLI (Ital. little worms), a fine kind of Macaroni (q. v.).

VERMICULA'TION, checkering or chancelling formed in mason-work as an ornament, giving the appearance of being eaten by worms.

VE'RMIFUGES, VE'RMICIDES, or ANTHELMINTICS, are remedies which possess the property of destroying intestinal worms, or of expelling them from the digestive canal. The only worms whose presence in the intestinal canal is so common, that the remedies for their destruction and expulsion require special notice, are the two varieties of tapeworm known as *Tænia solium* and *Tænia mediocanellata*, or the *hooked* and the *hookless Tapeworm* (q. v.) the *Ascaris lumbricoides*, or *large round worm*, and the *Ascaris* or *Oxyuris vermicularis*, or *small threadworm*. A few of this class of medicines are said to be useful in destroying all these kinds of worms—viz., the tapeworms, the round worms, and the threadworms. In this category, we may place *Absinthium*, or *wormwood*, whose effects are doubtful; *Sabadilla*, or *Cevadilla*; *Santonica*, or *worm-seed*, and its active principle, *Santonin* (q. v.); and *Oil of Turpentine*. As in our notices of the different human entozoa, we have referred to this article for the appropriate treatment of each, we will commence, in consequence of its greater importance, with the remedies that have been recommended in tapeworm, ranging them according to the repute in which they stand. (1.) The root of the male shield-fern (*Aspidium filix mas*), of which the best preparation is the 'Liquid Extract of Fern-root' of the *Pharm. Br.* It may be taken in the morning before breakfast, in doses of about a scruple, in the form of an emulsion with yelk of egg, syrup of orange-peel, and water; and if the worm does not come away in six hours, a brisk purgative should be administered. Generally, however, it is expelled by a single dose, in the mass, and without pain or much uneasiness. (2.) *Cusso* or *Kousso*, the flowers of *Brayera anthelmintica*, in doses of from half-an-ounce to an ounce of the flowers (infused for a quarter of an hour in ten ounces of lukewarm water and a little lemon-juice), or of four ounces of the infusion of the *Pharm. Br.*, and following in four hours, if it has not acted, by a dose of castor oil, is a safe and very sure remedy. (3.) Decoction of the bark of the root of the Pomegranate tree (*Granati radix*). (4.) *Oil of Turpentine* (q. v.); and besides these, which are the best remedies, the seeds of the Common Pumpkin (*Cucurbita pepo*); *Kamela*, the powder adhering to the capsules of *Rottlera tinctoria*; Santonine, &c., have found their advocates. All these medicines should be taken fasting, or after a light supper on the previous evening.

Foremost amongst the remedies for *Ascaris lumbricoides*, Dr Cobbold places *Santonin* (q. v.); but kamela is also very efficacious in doses of from one to two drachms every four hours. Dr Waring, in his *Materia Medica*, gives a long list of remedies employed with success in the East, but unknown in this country. *Ascaris vermicularis*, or the *threadworm*, is more successfully attacked locally in the rectum by injection, than by medicines administered in the ordinary method. Amongst the best forms of enemata are half a drachm of tincture of sesquichloride of iron in a little gruel, retained in the bowel as long as possible, or injections of salt and water, or of infusion of quassia. As an internal remedy, santonine is the best. The most annoying symptom occasioned by these worms, the intense itching about the lower part of the bowel, especially in the evening and at night, is best relieved by the introduction of a little mercurial ointment within the verge of the anus, when the patient retires to rest.

VERMI'LION, or artificial Cinnabar (q. v.), is a bisulphide of mercury, formed by mixing 100 parts of the metal with 16 parts of sulphur, and subliming them in properly constructed retorts; the result is, heavy dull red cake, an inch or so in thickness, of acicular crystalline texture, and exactly resembling in these respects the native cinnabar. When, however, it is finely powdered, it acquires the beautiful bright red colour so well known in this pigment. The finest European vermilion was, until lately, made at Utrecht in Holland, and this manufactory supplied nearly all Europe. It is now, however, manufactured in other places, particularly in Istria. A new process, invented by Kirchoff, has also been introduced, and is employed in most manufactories for making the finest quality. It is called the humid process, from the employment of water, with which the ingredients are triturated at a temperature of not more than 130° F., until the mixture, which is first black, turns a brownish red, when the temperature is lowered to 114° F., and steadily maintained at that until the brightest colour is obtained; it is then allowed to subside, the liquid is decanted off, and the residue washed in clean water. The Chinese have always been famous for the extreme beauty of their vermilion.

VE'RMIN (Lat. *vermis*, a worm), a term commonly applied to small noxious animals, particularly to those which, unless their increase is checked, are apt to become excessively numerous. Of some of the applications of this term, as to parasitic insects, it is unnecessary to say anything; but it seems proper to notice the use made of it by farmers and gardeners, with reference to quadrupeds and birds injurious to their crops, and by gamekeepers with reference to those which are destructive to game. In the estimation of the gamekeeper, all those animals are vermin which are known ever to prey upon any kind of game, or to rob the nests of game-birds. He therefore wages unceasing war not only against foxes and polecats, but against weasels, stoats, hedgehogs, kites, hawks, carrion-crows, magpies, and owls. The results are not agreeable to the farmer, as the balance of nature being thus interfered with, animals destructive to his crops multiply without restraint, particularly rats, mice, and voles. The farmer is apt to regard some kinds of game themselves as vermin, especially hares and rabbits, which, when very numerous, cause him great loss. As to these, probably, there might be ready enough means found of reducing their numbers, if it were permitted, even although an undiminished assiduity should be maintained in killing all beasts and birds of prey. It is otherwise, however, as to the smaller quadrupeds already named, and the destruction of their natural enemies is followed by their excessive multiplication. Beasts and birds of prey have their use in the economy of nature. The larger kinds, which are dangerous to man himself, or destructive of the animals valued by him as his property, are no longer of use in thickly-peopled and extensively cultivated countries; their extirpation is therefore to be desired, and they rapidly disappear before advancing civilisation; but their use in a different state of things may be seen, if we reflect on the vast multitudes of antelopes and other herbivorous animals in the wilds of Africa, which would soon cease to find sustenance for themselves, but for these destroyers. Kites, kestrels, owls, weasels, and hedgehogs are particularly useful to the British farmer, as preying upon the mice and voles, which are often extremely destructive to his crops, eating whole rows of seed-wheat and beans, proceeding from one end of the row to the other; and all the injury done to him by game, or at least by feathered game, is generally little in comparison with that which results from the continual shooting and trapping of them by gamekeepers. No expedient is known so likely to rid the fields of mice and other such pests, as to put a stop to the destruction of the quadrupeds and birds which prey upon them.

The farmer himself, however, sometimes falls into the error of seeking to interfere unduly with the balance of nature—complaining of rooks as a mere nuisance, and demanding the destruction of rookeries. The money which he expends in guarding his fields from rooks at certain seasons, when they are apt to injure his crops, is more than repaid by their services at other times in the destruction of grubs. Wood-pigeons, which have of late become extremly numerous in some parts of Britain, do more harm to the farmer than rooks, as they feed chiefly on grains, seeds, young clover, and the like, and are very voracious; yet they seldom dig much, but take only what is on the surface of the ground. They, however, are now regarded in the light of true farm-pests. Small birds, such as feed both on insects and seeds, are, like rooks, not to be regarded as vermin. They consume, it is true, a certain portion of the grain, but they are of incalculable use in devouring those insects which are the worst of all destroyers of crops. The consequences which have ensued from the great reduction of the numbers of small birds in France, where they are eagerly sought for the table, should act as a warning to the farmers of all other countries. The most intelligent agriculturists of France are now extremely anxious for the increase of the numbers of small birds, as their only protection against caterpillars and grubs of many kinds. To give a premium for the destruction of sparrows, as is sometimes done in England, is bad policy, unless peculiar local circumstances have led to their extraordinary multiplication.

Moles are amongst the animals commonly regarded as vermin by farmers and gardeners; and in gardens they are certainly a pest; but it is probable that many pastures owe much of their long-continued fertility to the incessant stirring of the soil by moles; and when they are not excessively numerous, it may be better to undertake the labour of scattering the mole-hills, than to attempt the destruction of the creatures which throw them up.

Even rats and mice, although often amongst the most troublesome of vermin, are not, in all circumstances, to be regarded as mere pests. They are so, it is true, in fields, in houses, and in ships; but much of the refuse of towns would probably become far more offensive and injurious than it is, if it were left to putrefy, and the rats, which frequent the most filthy places, render valuable service by devouring it. Police regulations may be imagined, which, if strictly enforced, would render the presence of rats no longer desirable; but in this case, their numbers would probably soon diminish with the diminution of their supply of food.

Some of the means used for the destruction of vermin may be briefly noticed. Besides the use of cats for catching mice and rats, and of dogs, particularly terriers, to kill rats, the principal means employed are traps and poison. Of traps for rats and mice, there is great variety. The common wire spring-trap for mice, baited with cheese or scorched oatmeal, which catches them by the neck and chokes them, on their biting through a thread, in order to reach the bait, is probably the best, and is too well known to need description. The stamp spring-trap in general use for rats is equally well known, but is liable to the objection, that cats, or even dogs, may be caught in it, and have their legs broken, or be otherwise injured, when it is placed in situations to which they have access. Rats also learn to apprehend danger, and avoid the trap; their sense of smell probably guiding them, which is very acute, and apprises them of the touch of human hands. To overcome this difficulty, oil of aniseed, or oil of caraway, is often used, which seems to render the bait more attractive, at the same time that it hides the warning smell. Professional rat-catchers ascribe especial value to oil of rhodium, but it is more expensive than the oils

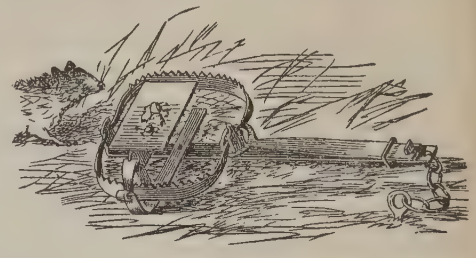


Fig. 1.—Common Stamp Spring-trap, baited and set.

already named. The poison most commonly used is the white oxide of arsenic, which, however, must be used with great caution, so that only the creatures for which it is intended may get at it. Pieces of bread and butter sprinkled with sugar are laid down for a day or two, and then bread and butter sprinkled with arsenic; some of the oils which have been mentioned being at the same time employed. A better mode of poisoning rats is by a preparation devised by Dr Ure, which is fatal to them, but scarcely dangerous to other animals. Hog's-lard is melted in a bottle plunged in water at a temperature of 150° F., and an ounce of phosphorus is added to every pound of lard, with a quantity of proof-spirit, to aid the mixture of the lard and phosphorus, which, when cooled, form a white mass, the spirit separating from it, so as to be fit for use again. This compound, very gently warmed, and mixed with flour and sugar, may be made into pellets, flavoured with some of the attractive oils, and laid down near rat-holes. It is also used with advantage for field-mice, small pellets being scattered where they are very abundant. It is safer for this purpose than nux vomica, which is sometimes used, and more effectual than the powder of hellebore and stavesacre seeds.

In farm-yards, the precaution of placing ricks on frames or supports which mice cannot climb, is of great importance, as mice, when they get into a rick of corn, soon multiply excessively, and effect great destruction. No sticks should be allowed to rest against ricks. Corn in stacks may be secured from mice by building them on stone staddles, with an overhanging ledge, or on iron staddles, the smoothness of the iron preventing mice and rats from climbing.

The method employed with great success for destroying the field-vole, or short-tailed field-mouse, by digging pits, is noticed in the article VOLE.

Rats may be destroyed in great numbers in a barn, if it can be made nearly air-tight, by placing in it a number of chafing-dishes, filled with lighted charcoal, strewing over them bits of broken stick-brimstone; after which the barn must be quitted as quickly as possible, the door closed, and so left for two days. When the door is opened again, numerous rats will be found lying dead. Another method is that of spreading the floor with caustic potash, which, adhering to the rats' feet, is licked off. The result is obvious.

Where rats and mice are not very numerous, the trap is sufficient, but where they swarm, poison must be employed.

Rubbing the hands with a mixture of essential oils, before setting the trap, is enough to prevent

the smell of the hands from being noticed by rats.

Subjoined are illustrations of two traps for taking vermin either alive or dead. They are the invention of Mr Miles, gardener at Roslyn House, Hampstead, and have been found, we believe, to answer well.

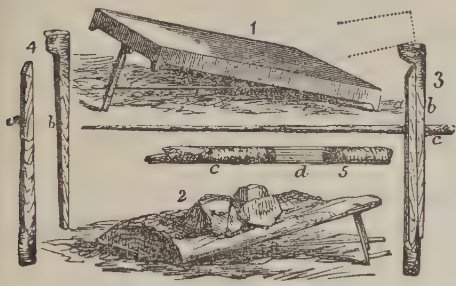


Fig. 2.—Miles' Patent Vermin Traps:

1, trap set for catching animals alive; 2, trap, on the same principle, for killing animals, it being simply a slab of wood loaded with stones; 3, 4, enlarged view of apparatus for setting; a, the strut-piece, which rests on the ground, is bevelled at the top, to catch in the notch of the other strut-piece, b; they are held loosely in position by a notch, d (5), in the piece c, to the end of which the bait, e, is attached. When the animal touches the bait, it detaches the piece c, causing the two strut-pieces to topple over and release the trap.

A very good box-trap used for rats, and also for martens, &c., is open at both ends, the doors closing when the animal runs upon a bridge in the middle. Another and very simple kind of box-trap is used for rats, open only at one end, the bait placed near the other, and connected with a string, which, being loosed whilst the bait is being eaten, the door falls. This trap, however, can secure only one rat at a time.

Mixture of oils recommended for rats: oil of rhodium, 1 scruple; oil of caraway, 1 drachm; oil of lavender, 5 drops; oil of aniseed, 10 drops; tincture of musk, 2 drops.

A stamp-trap, such as is used for rats, is used also for foxes, wild-cats, &c.—the difference being merely in size.

VE'RMONT (Fr. *verd mont*, green mountain), one of the U. S. of America, one of the five New England states, and the first state received after the adoption of the Federal constitution; lat. 42° 44′—45° N., and long. 71° 25′—73° 26′ W.; bounded on the N. by Canada; on the E. by the Connecticut River, which separates it from New Hampshire; on the S. by Massachusetts; and on the W. by New York, from which it is separated for 100 miles by Lake Champlain. It has an area of 10,212 sq. miles, and is divided into 14 counties. The principal towns are Burlington, Montpelier (the capital), Rutland, Bennington, Windsor, St Albans. The surface is rather hilly than mountainous, the Green Mountains being rounded eminences 2000 to 2500 feet, covered with vegetation, and cultivated to their summits. The rivers are the Connecticut and its western branches, and the Onion, Lamoille, and smaller streams, affording abundant water-power, and falling into Lake Champlain (q. v.). The state is studded with small lakes. The geological formations are the azoic and the lower groups of the Silurian. East of the Green Mountains is a bed of Devonian limestone, 20 or 30 miles wide. Drift covers the whole state. Along the western part of the state, a great belt of quartz is covered by a bed of crystalline limestone 2000 feet thick. Slates are found on Lake Champlain, with hæmatite iron, supplying several blast-furnaces. There are deposits of gold, pyritous copper ore, and at Rutland, rich quarries of statuary marble. Clay for white stoneware is found at Bennington, and there are several quarries of soapstone. The climate is cold, with long and severe winters, but healthful—the temperature ranging from —17° to +92°. The soil is a rich loam, and the country well wooded with hemlock, fir, spruce, oak, beech, sugar-maple, pine, hickory, elm, butternut, birch, cedar, &c. The hills are well adapted for pasturage. The chief products are wool, cattle, maple-sugar, butter, cheese, hay, and potatoes. In 1870 there were 34,540 farms, averaging 134 acres, cultivated by their owners; and the live-stock was valued at 23,888,835 dollars. The state has some fine scenery, and beautiful waterfalls—as Bellows Falls on the Connecticut, the Great Falls of the Lamoille, Falls of the Winooski, a fall of 70 feet on the Missisquoi, &c. There are 687 miles of railway, two lines crossing the mountains. The chief business is agriculture. In 1870 there were 8 cotton-mills, 65 woollen-mills, and manufactures of lumber, machinery, leather, bar and pig iron, scales, &c. V. has 699 churches, or 1 to every 472 inhabitants; 3 colleges—the University of V. at Burlington, Middlebury College, and Ripley Female College—with several theological and medical institutions; 41 academies, 3 normal schools, and 2827 district free schools, with 52,067 pupils in attendance; 43 weekly and 3 daily newspapers. The government is of the usual republican form. The governor has a salary of $1000; the state treasurer, $500; and the secretary of civil and military affairs, $275 a year. There are two houses of the legislature, elected by 'every male citizen of peaceable behaviour, 21 years old, and 1 year resident in the state.' The first settlement in V. was in 1724, when it was claimed as a part of the New Hampshire grants. In 1763, it was claimed by New York, under grants of Charles II. to the Duke of York. For ten years, the New York officers were resisted, and sometimes tied to trees and whipped by the lawless settlers. These contests were stopped by the Revolution; but V., a refuge for settlers from the other states, remained eight years out of the Union. It was chiefly the V. militia that gained the victory of Plattsburg, on Lake Champlain, in 1812; and the Green Mountain state contributed largely to the Union forces in the War of Rebellion. The pop., containing less than $10\frac{1}{2}$ per cent. of persons of foreign birth, mostly from Ireland and Canada, with a very slight increase, owing to the large emigration to the western states, was in 1860 315,116; in 1870, 330,551; and in 1880, 332,286.

VERNAL GRASS, Sweet (*Anthoxanthum odoratum*), a grass very common in Britain, in Europe in the United States, and the northern parts of the world generally, growing in meadows, woods, and pastures. It is about a foot high, with spiked oblong panicle, the flowers remarkable as having only two stamens. The spikelets are 1-flowered; the glumes very unequal; the floret accompanied with two rudimentary florets, which botanists have very generally described as two outer paleæ. This grass flowers earlier in summer than most of the European grasses. It is relished by cattle, and is sown along with other grasses to form permanent pastures. The pleasant smell of newly-mown hay is often chiefly owing to this grass, which is fragrant when drying, and contains Coumarin (q. v.). It yields, by distillation, an essential oil of an agreeable odour. The straw of this grass is of use for the finest kinds of straw-plaiting.

VERNA'TION, in Botany, a term employed to designate the manner in which the leaves are arranged in the leaf-bud. It corresponds with

ÆSTIVATION (q. v.) in the flower-bud. There are great differences in the vernation of plants, and these differences are characteristic not only of species but of genera, and even of natural orders, but the vernation of the same species is always the same. The vernation of plants is very interesting; in some, the leaves are very simply placed together; in others, they are most curiously folded, rolled, or plaited, and interlaced with each other, yet so as to separate most readily when the proper time for their expansion comes.

VERNET, ÉMILE-JEAN-HORACE, a celebrated French painter of battle-pieces, in whom may be said to have culminated the talent of a family through several generations distinguished in the sphere of art. His grandfather, CLAUDE JOSEPH, born in 1714, was a native of Avignon. By Antoine Vernet, his father, also a painter, Claude Joseph was early initiated in art, and going at the age of 18 to Italy, he remained there 20 years. Towards the end of that period, much of which had been passed in struggle and privation, his reputation as a landscape and marine painter had become so high, that he was invited to Paris by Louis XV., who assigned him apartments in the Louvre. Between this time (1752) and his death in 1789, he painted an immense number of pictures, one of his chief undertakings being a series of large pieces commissioned by government, representing the chief seaports of France. These were 15 in number, and are still to be seen in the Louvre, with many other of his best works. During his life, he was held to be, in France, without a rival in his own department; and an honourable rank continues to be assigned him among the painters of his country. He married at Rome an English lady, a Miss Parker, by whom he had a son, ANTOINE-CHARLES VERNET, born at Bordeaux in 1758, and popularly known as Carle Vernet. Carle received his education, in the first instance, from his father, and afterwards at the Academy of Paris, where, in 1782, he gained the chief prize, which brought with it the privilege of which he availed himself, of studying for some years in Rome. His subsequent success in Paris was great; he achieved the highest honours of his profession, became Chevalier of the order of St Michel, as also of the Legion d'Honneur, and died September 27, 1836. He was especially celebrated as a painter of horses; but his chief works were battle-pieces on a large scale, chiefly commemorative of the triumphs of the great Emperor, and as such, amazingly popular with the Parisian public. The principal are—'The Battle of Marengo,' 'The Morning of Austerlitz,' 'The Emperor giving orders to his Marshals,' 'The Bombardment of Madrid,' 'Battle of Rivoli,' 'Entrance of Napoleon into Milan,' and 'Battle of Wagram.'

The youth of HORACE VERNET, his son (born in Paris, June 30, 1789), was passed amid the tumults and anarchy of the Revolution; and his general education was as irregular and incomplete as in such an element we might suppose it; but he had in his father a capable instructor in art, the hereditary genius for which very early became noted in him. It was the wish of his father that as he had himself done, his son should go to study at Rome; but he failed in the competition for the travelling-pension for that purpose, given by the *Académie des Beaux Arts*, and the scheme was necessarily abandoned. Undepressed by his disappointment, the young V. married, and commenced his independent career as a painter, being then (1809) only 20 years of age. The *rôle* which he chose was that suggested at once by the previous success of his father, and the military intoxication of the Parisian public. Young as he still was, he had served for some time as a soldier, not, so far as is known, with any special distinction, yet, doubtless, with such practical experience of the detail of a soldier's life in the field, as would be found exceedingly available in his efforts for distinction of another kind. Whereas the treatment of military subjects by his father and others had been, hitherto, more or less of the conventional and so-called imaginative kind, more properly to be called imaginary, the new aspirant, with his fuller sympathy and knowledge, sought for his effects in that serious rendering of truth which is the basis of all authentic imagination. In the halt, the bivouac or the battle, the French soldier should be painted according to the veritable fact of the matter, as V. himself had seen, or could rigorously so conceive it. The success which rewarded this attempt at more earnest and truthful conception, was brilliant and instantaneous, his very first pictures of the kind—'The Dog of the Regiment and the Horse of the Trumpet,' 'Capture of the Redoubt,' 'Halt of French Soldiers,' &c.—being received with an enthusiasm of favour accorded to those of no other artist. In 1812, to confirm this popular approval, the first-class medal was awarded to him; and in 1814, he had the title conferred on him by the Emperor of Chevalier of the Legion d'Honneur. The unrivalled popularity which he had thus at a bound achieved, ever afterwards remained with him; and the favour which he enjoyed from the Emperor, whose victories he signalised on his canvas, was continued to him by the restored dynasty, whose sympathy with these favourite subjects, which, as occasion served, he continued as before to paint, could only be supposed imperfect. By Charles X. he was, in 1825, made Officer of the Legion d'Honneur; and in the next year, he was elected Member of the Institute. In 1827, he was appointed Director of the French Academy at Rome, whither he went to reside. He remained there for several years; and on the withdrawal of the French Legation, occasioned by the revolution of 1830, he was appointed to act as representative of his country at the Roman court.

With Louis Philippe, the services of V. were in especial request; and one of his most gigantic undertakings, the grand series of paintings in the Constantine Gallery at Versailles, commemorative of the triumphs of the French arms in Algeria, was a task prescribed him by that monarch. In pursuance of this object, he more than once visited Algeria; as, indeed, throughout his career, he frequently became a traveller on similar professional errands. To the last, honours continued to flow upon him. In 1842, he was made Commander of the Legion d'Honneur; and in the Universal Exposition of 1855, the grand Medal of Honour was awarded to him. He died January 17, 1863. He left behind him no children; his only daughter, wife of the celebrated Paul Delaroche, having died in 1845.

Though he by no means exclusively confined himself to military subjects, as witness his well-known 'School of Raphael,' 'Judith and Holofernes,' and many others, it is on his consummate treatment of these that his fame mainly rests; and in this particular department, though he has many worthy competitors among his countrymen, no one of them can be said to equal him. With the utmost skill in effective composition, he combines in these works a surprising dash, vigour, and truthfulness; the movement and veritable fiery life of conflict is expressed in them with amazing effect. In the London International Exhibition of 1862, some good specimens were exhibited.

VERNIER, a scale, by which linear or angular

magnitude can be read off with a much greater degree of accuracy than is possible by mere mechanical division and subdivision, derives its name from its inventor, Pierre Vernier, 'Capitaine et Chastellaine pour sa Majesté au Chasteau Dornans,' who gave a description of it in a tract published at Brussels in 1631. The principle of this invention is essentially as follows: AB (fig. 1) is a portion of the graduated scale of an instrument

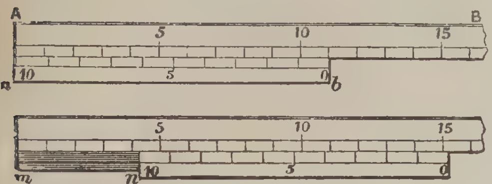


Fig. 1.

shewing divisions and subdivisions; *ab*, a small scale (called the *vernier*), made to slide along the edge of the other, and so divided that *ten* of its subdivisions are equal to *eleven* of the smallest divisions of the scale AB; then each division of the vernier is equivalent to $1\frac{1}{10}$th of a subdivision of AB; and consequently, if the zero-point of the vernier be (fig. 1. A) opposite 11 on AB, the 1 on the vernier is at $9\frac{9}{10}$ ($1\frac{1}{10}$ below 11), 2 on vernier is at $8\frac{8}{10}$ ($2\frac{2}{10}$ below 11), &c. Also, if the vernier be slid along so that 1 on it coincides with a division on the scale, then 0 on the vernier is *one*-tenth above the next division on the scale; if 4 on the vernier coincide with a division on the scale, the 0 of the vernier is *four*-tenths above a division. The vernier is applied to instruments by being carried at the extremity of the index-limb, the zero on the vernier being taken as the index-point; and when the reading-off is to be performed, the position of the zero-point, with reference to the divisions of the scale, gives the result as correctly as the mechanical graduation by itself permits, and the number of the division of the vernier which coincides with a division of the scale, supplements this result by the addition of a fractional part of the smallest subdivision of the scale. Thus (fig. 1, B), suppose the scale-divisions to be degrees, then the reading by the graduation alone gives only a result between 15° and 16°; but as the 2d division of the vernier coincides with a graduation on the scale, it follows that the zero-point is $\frac{2}{10}$ths of a division above 15°, and that, therefore, the correct reading is 15°·2. It will be at once seen that by merely increasing the size of the vernier, as, for example, making 20 divisions of it coincide with 21 on the scale, the latter may be read off to $\frac{1}{20}$ths; and a still greater increase in the size of the vernier would secure further accuracy.

The above is the vernier as proposed by its inventor, and as it was employed for long after his

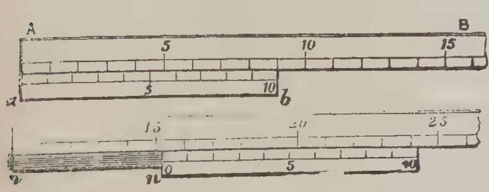


Fig. 2.

time; but in the more recently constructed astronomical and geodesical instruments, a vernier is employed which has one graduation *more* (fig. 2) than the corresponding portion of the scale. A little consideration will shew that the only effect of this modification is to enable the vernier to be graduated towards the same direction as the scale, and thus save a little confusion in the reading off. In small instruments, or where the utmost accuracy is required, a small magnifying lens is fixed over the vernier, to enable the observer, in cases where no two graduations coincide (which is generally the case), to estimate the amount of error introduced by assuming that the two graduations which approach nearest to coincidence actually coincide.

Of the various methods for subdivision which were in use before the introduction of the vernier, the most important were the *Diagonal Scale* (q. v.) and the *Nonius*. The latter, so called from its inventor, Petrus Nonius (Pedro Nunez), a Portuguese mathematician, who described it in a treatise *De Crepusculis Olyssipone*, published in 1542, consists of 45 concentric circles described on the limb, and divided into quadrants by two diameters intersecting at right angles. The outermost of these quadrants was divided into 90, the next into 89, the third into 88, &c., and the last into 46 equal parts, giving on the whole a quadrantal division into 2532 separate and unequal parts (amounting on an average to about 2′ intervals). The edge of the bar which carried the sights passed, when produced, through the centre, and served, consequently, as an index-limb; and whichever of the 45 circles it crossed at a graduation, on that circle was the angle read off; for instance, if it cut the 7th circle from the outside at its 43d graduation, the angle was read off as $\frac{43}{84}$ths of 90°, or 46° 4′ $17\frac{1}{7}''$.

VERNON, a small town of France, in the dep. of Eure, stands on the left bank of the Seine, 50 miles west-north-west of Paris by the Havre, Rouen, and Paris Railway. It contains a handsome Gothic church, and numerous picturesque old houses with wooden frameworks, and is the seat of some trade in grain.

VERO'NA, an ancient and interesting city of Northern Italy, in Venetia, stands on a plain at the foot of the hills which lie at the base of the Tyrolese mountains, 72 miles west of Venice by railway. It stands on the Adige, by which it is divided into two unequal parts, connected by four bridges. The aspect of the town, and of rich landscape around, is considered remarkably fine. V. is a fortress of the first rank, a member of the famous Quadrilateral (q. v.), and has always been considered a place of strength since it was surrounded with walls by the Emperor Gallienus, 265 A. D. Its modern fortifications are amongst the most extraordinary works of military engineering in Europe. After passing into the hands of the Austrians in 1815, it was greatly strengthened; and since 1849, every effort has been made to render it impregnable. Of its many interesting edifices, the chief is the amphitheatre, built, it is supposed, between the years 81 and 117 A. D. The building has been wonderfully preserved, the interior being still, to all appearance, complete. The lesser diameter of the building is 404 feet, that of the arena 146 feet; and the edifice is calculated to have contained 22,000 people. This, as well as many of the other structures of the city, has a handsome appearance, owing to having been built of Verona marble. The Porta dei Borsari and the Arco de Leoni are fine Roman gateways, both of the imperial age. The streets of V. are wide, especially the Corso; there are four principal squares, of which the Piazza dei Signori contains the palace of the Della Scala and the superb Palazzo del Consiglio, the façade of which is adorned with bronze and marble statues of celebrated natives of V., including Catullus, Pliny

the Younger, &c. The picture-gallery contains about 400 specimens, including a Transfiguration by Titian, and a full-length portrait and a Deposition by Paul Veronese. The cathedral, the date of which is uncertain, but which is attributed to Charlemagne, has a handsome porch, guarded by the celebrated paladins, Roland and Oliver. The more modern parts of the cathedral are exceedingly rich, and among other excellent works of art, it contains a famous Assumption by Titian. Altogether, there are in V. about 40 churches, many of them beautiful specimens of Gothic architecture, and containing valuable paintings and other art treasures. The palaces are also numerous and fine; and there are several theatres, hospitals, &c. Manufactures of woollen goods, hats, cotton, silk, hemp, and hosiery are carried on; and the town trades considerably with Venice in garlic sausages. Excellent cattle are reared on the rich pasturage of the vicinity. Wines and fruit are good and abundant. Pop. (1879) 66,151.

The early history of V. is involved in obscurity, and there is some difficulty in determining whether it originally belonged to the Euganei or the Cenomani. It afterwards fell into the hands of the Romans, and under the Empire became one of the most flourishing cities in the north of Italy. Constantine took it by assault in 312; Stilicho defeated the Goths here in 402. Charlemagne took possession of it, and made it the royal residence of his son, King Pepin. The Montagues, who were Ghibellines, lived here in perpetual and deadly enmity with the Guelf Capulets; and from the contentions that took place between these families, Shakspeare—drawing upon an Italian authority—has derived materials for his tragedy of *Romeo and Juliet*. In 1259, the town received Mastino della Scala as its ruler. In 1405, the city gave itself over to Venice, in order to free itself from its tyrants, who were alternately of the Scala, the Visconti, or the Carrara families, and has since shared the vicissitudes of the rest of Venetia.

VERONESE, Paul. See Cagliari.

VERO'NICA, the name of a supposed saint of the Roman Catholic Church, whose history, and indeed whose historical existence, has been the subject of much controversy. According to the legend, V. was one of the women who met our Lord on his way to Calvary; and as he was sinking, overpowered by fatigue, under the weight of the cross, V. offered him her veil, to wipe the sweat from his brow, when, wondrous to tell, the divine features were miraculously impressed upon the cloth, and remained as a permanent picture of the face of our Lord. This miraculous picture is reported to have been preserved in Rome at St Peter's Church from about the year 700. Another, of similar appearance, is preserved at Milan; and many Catholic writers, among whom are the learned Mabillon and Papebrook, have supposed that whatever is to be said of the legend of the pious woman at Jerusalem, the name 'Veronica' is but founded on an erroneous application of what in reality was meant to designate not the personage, but the picture, which was described as *vera icon* (Gr. *eikon*), 'the true image' (i. e., of Christ). Other writers, however, are of opinion that V. is a real name, and designates a real personage, although probably erroneously applied in this legend. The picture has been frequently reproduced both in painting and engraving; the most celebrated of the former is one by the great Spanish painter Morales, surnamed 'the Divine,' from his favourite subject, which was the countenance of our Lord in the 'Ecce Homo' and similar subjects.

VERONICA. See Speedwell.

VERSAILLES, a celebrated city of France, and long the residence of the French court, capital of the dep. of Seine-et-Oise, stands on a plain, 11 miles south-west of Paris by railway. A fine avenue, which forms part of the road from Paris, divides the town into two parts. The town covers a large area in proportion to its population, and is of remarkably regular construction, consisting of long and straight streets, crossing at right angles. V., a city more of pleasure than of industry, long accustomed to find its sustenance in the expenditure of a luxurious court, and at the present day a place of residence for many foreigners, attracted hither by the salubrity of the climate, the fine promenades, and the economy of living, as compared with that in Paris—has few manufactures, and little trade. It is the see of a bishop, and contains a public library of 50,000 vols., many palatial edifices, public fountains, spacious squares, and elm-planted avenues; and when taste in architecture and in landscape-gardening was more formal than at the present time, the town was esteemed the handsomest in Europe. The great attraction of V. is its palace, and the history of this structure may be said to be the history of the town. The site occupied by the palace is known to have been that of the ancient priory of St Julien, the chronicles of which place the date of the building in the early times of the Capetan monarchy. Later, the priory became a feudal stronghold, and its first superior, *Hugo de Versaliis*, lived in the 11th century. In 1570, the manor belonged to Martial de Léoménie, one of the victims of St Bartholomew. The building was converted by Louis XIII. into a château; and Louis XIV. devoted enormous sums to its embellishment, or rather reconstruction. Louis XV. altered the arrangement of the interior and meditated alterations that would have changed the whole character of the edifice, but which he was unable to carry out from want of money. Under Louis XVI., V. continued to be one of the usual residences of the court down to the period of the Revolution, which great event had its beginning here in the meeting of the States-general, in May 1789. Louis Philippe transformed the palace of Louis XIV. into a museum to contain trophies of the victories of France. The approach to the palace is by the *Place d'Armes* and the *Cour d'Honneur*, in the latter of which is a large equestrian figure of Louis XIV. and other statues. The entire length of the palace is nearly 1400 feet. The collections embrace pictures of celebrated events in French history, portraits of French heroes, &c. The most interesting pieces of art are the pictures by David which illustrate the career of Napoleon, and those by Horace Vernet. The gardens, with their broad terraces and long alleys, are imposing, but formal; the fountains are on the grandest scale. From the middle of September 1870, till the conclusion of peace, in 1871, V. was the centre of all the operations of the Germans On September 20 King William and the Crown Prince entered the town; and there, on January 8, 1871, the former was proclaimed emperor of Germany. On January 28 the capitulation of Paris was signed in V. After the peace it became the seat of the National Assembly and government of the republic, and was the headquarters of the army under General MacMahon. Pop. about 50,000.

VERSE (Lat. *versus*, from *verto*, to turn, a turning of the plough, a furrow; a row; a line in writing and in poetry), a section or group of metres written in one line. See Metre, Rhime. The term Verse is often erroneously applied to a group of lines or verses, which is properly a stanza. Verse is often used to signify metrical composition.

VE'RSECZ, a fortified town of the Temesvar Banat, stands on the Versecz Mountains, 45 miles south of Temesvar by railway. It is the seat of a Greek Non-united bishop. The chief industry is the production of silk, wine, and rice. Pop. 17,800.

VE'RSICLE (Lat. *versiculus*, a little verse), a short verse in the service, which is spoken or chanted by the priest or minister alternately with a 'response' by the people.

VERSIONS. See BIBLE.

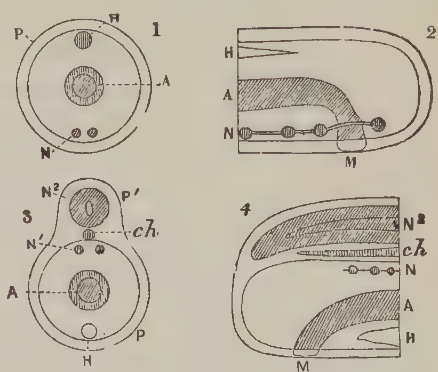
VERST, or **WERST**, in Russian, *wersta*, an itinerary measure, equivalent to 1166¼ yards, or about two-thirds of an English mile.

VERT. See HERALDRY.

VE'RTEBRÆ. See SPINAL COLUMN and SKELETON.

VE'RTEBRATA, the highest and most important of the animal sub-kingdoms, characterised by the universal presence of a backbone, composed of a varying number of small bones called vertebræ (see SKELETON and SPINAL COLUMN), which at once serve for the general support of the other parts, and for the protection of the central part of the nervous system (the brain and spinal cord) in a closed cavity in the interior.

We shall notice first the developmental and then the structural peculiarities of the vertebrates. Like the members of the other sub-kingdoms, the vertebrates begin in a semi-fluid nitrogenous substance called plasma, which separates itself (or differentiates, as it is scientifically termed) into albumen, fibrin, primary membrane (the lemma of Owen), nuclei, and cells, in which form, says the above-named physiologist, 'the individuality of the new organism first dawns as a nucleated germ-cell, or germinal vesicle.' The formation of yolk by the evolution of albuminous granules and oil-particles from the plasma, and the development of an outer layer of membrane, complete the unimpregnated egg. For further development, another principle, the spermatozoon, or product of the sperm-cell, is required. Its reception by the egg is followed by the formation of a germ-mass, which is formed by consecutive divisions, cleavages, or segmentations of the impregnated centre, which incorporates more or less of the yolk. Thus far there is no difference between the vertebrate and the invertebrate germ. The next step, to use the words of Professor Owen, 'impresses upon the nascent being its *vertebrate* type.' As has been shewn in the article DEVELOPMENT OF THE EMBRYO, the parietal portion of the germ becomes raised up on each side into a ridge, so that a long groove or furrow is formed between these parallel ridges (see figs. 6, 7, 8 in DEVELOPMENT); and the margins of these subsequently uniting with one another, constitute a tube, in the interior of which the vertebrate cerebro-spinal nervous centres are developed. In the meantime, the margins of the germs extend downwards over the yolk till they meet and form the abdominal cavity. Hence, in the vertebrates, there are developed from the *chorda dorsalis*, or *notochord* (see DEVELOPMENT), 'a pair of plates "neurad," * to enclose the nervous axis, and a pair of plates "hæmad," † to enclose the vascular axis and organs of vegetative life. Flesh and skin co-extend with the enclosing plates. This formation of two distinct parallel cavities—neural and hæmal—under symmetrical guidance, in the vertical or "neuro-hæmal" direction, with a repetition of parts on the right and left sides, establishing transverse or "bi-lateral" symmetry, constitutes the chief developmental characteristics of the vertebrate animal.'—Owen's *Anatomy of Vertebrates*, vol. i. p. 2. The accompanying diagrams, which we have borrowed from Professor Huxley's *Elements of Comparative Anatomy*, may tend to render this subject more intelligible. In the invertebrates, merely a single saccular or tubular investment is formed, which encloses all the viscera; so that, provided we select one high enough to possess a heart and nervous system—the transverse and longitudinal sections would be represented by 1 and 2, while P



Diagrams representing generalised sections of one of the higher Invertebrates (1, 2) and of a Vertebrate (3, 4).

1, 3, transverse; 2, 4, longitudinal section; A, alimentary canal; H, heart; P, parietes of the body; P′, parietes of neural canal; N, nervous centres of Invertebrate; N′, sympathetic, and N², cerebro-spinal centres of Vertebrate; *ch*, notochord; M, mouth.

represents the parietes, or wall of the body, A the alimentary canal, M the mouth, H the heart, and N the nervous centres. 'It will be observed,' says Professor Huxley, 'that the alimentary canal is in the middle, the principal centres of the nervous system upon one side of it, and the heart upon the other. In none of these animals, again, would you discover in the embryonic state any partition formed by the original external parietes of the body between the nervous centres and the alimentary canal.'—*Op. cit.*, p. 59. But the vertebrate, after it has passed through its very earliest stages of development, is, as we have seen, not a single, but a double tube; and the 'two tubes are separated by a partition, which was, primatively, a part of the external parietes of the body, but which now lies in a central position between the cerebro-spinal nervous centres and the alimentary canal. Hence a transverse section of any vertebrated animal may be represented diagramatically by fig. 3, where, for the most part, the letters have the same signification as in the foregoing case, but where P′ denotes the second or cerebro-spinal tube. The visceral tube (P) contains, as in the case of the invertebrate animal, the alimentary canal, the heart, and certain nervous centres belonging to the so-called sympathetic system. This nervous system and the heart are situated upon opposite sides of the alimentary canal, the sympathetic corresponding in position and in forming a double chain of ganglia with the chief nervous centres of the invertebrata; so that the cerebro-spinal tube appears to be a superaddition—a something not represented in the invertebrate series. In close connection with the profound difference between the chief nerve-centres of the vertebrate and the invertebrate, is another remarkable structural contrast. In all the higher invertebrates, with a well-developed nervous system, the latter is perforated by the gullet, so that the mouth is situated

* Backward in man, upward in beasts.
† Forward in man, downward in beasts.

upon the same side of the body as the principal masses of the nervous system; and some of the ganglia of the latter lie in front of, and others behind the œsophagus. A longitudinal section of such an animal may therefore be represented by fig. 2. A similar section of a vertebrated animal shews, on the contrary, the chief centre of the nervous system not to be perforated by the œsophagus, the latter turning away from it, and opening upon the opposite side of the body (fig. 4).'—*Op. cit.*, p. 60. No structures having any analogy to the *chorda dorsalis*, or *notochord*, or to the *visceral arches* and *clefts* (see SKELETON), are to be found in the embryonic condition of any of the invertebrates.

Passing on from the developmental to the structural differences, we universally have the vertebral column and the nervous centres, consisting of brain and spinal cord; and the organs of the five senses are usually present. All possess a distinct vascular system, containing blood, with red and white corpuscles in suspension, and in all (with the solitary known exception of the *amphioxus*, or Lancelot), there is a compact muscular heart of two or more cavities, and provided with valves. The breathing organ communicates with the pharynx. The alimentary canal has two apertures, usually at opposite ends of the trunk, the mouth or reception aperture never being formed of modified limbs, or working horizontally, as in the *Articulata*, but provided with two bony jaws, placed one above the other, and acting vertically.

All vertebrates possess a hepatic portal system, by which the blood of the alimentary canal is collected into a portal vein, which ramifies through the liver. The limbs may be totally absent, or one or two pair, never more. The muscles surround the bony levers on which they act, and thus, under the influence of the will, move the limbs and other parts. The sexes are distinct.

Comparative anatomists differ in their division of the vertebrates into classes, and as to the best basis of classification. Professor Owen, in his *Anatomy of Vertebrates*, admits of only four classes, viz., Fishes, Reptiles, Birds, and Mammals; whereas Milne-Edwards, Huxley, and many of our leading authorities, separate the Amphibians from the Reptiles, and assign them a class by themselves. Professor Owen, after describing the modifications of the piscine, reptilian, avian, and mammalian types, observes that the vertebrates might be binarily divided into oviparous and viviparous; into anallantoic or branchiate, and allantoic or abranchiate; into *Hæmatothermal* (Gr. *haima*, blood, *thermos*, hot), having four-chambered heart, spongy lungs, hot blood, and *Hæmatocryal* (Gr. *haima*, blood, *cruos*, cold), having less perfect breathing organs, less complex heart, with cold blood; and adopts the latter. Huxley, on the other hand, after noticing the division of the vertebrates into *Branchiate* and *Abranchiate*, and pointing out the non-homogeneous character of the abranchiates—Mammals being so strongly separated from Birds and Reptiles—suggests the removal of them to an independent position. 'Thus,' he observes, 'the classes of the *Vertebrata* are capable of being grouped into three provinces: (1.) The ICHTHYOIDS (comprising Fishes and *Amphibia*), defined by the presence of branchiæ at some period of existence, the absence of an amnion, the absence of a rudimentary development of the allantois, nucleated blood-corpuscle, and a parasphenoid bone in the skull: (2.) the SAURIANS, defined by the absence of branchiæ at all periods of existence, the presence of a well-developed amnion and allantois, a single occipital condyle, a complex mandibular ramus, articulated to the skull by a quadrate bone, nucleated blood-corpuscles, and no parasphenoid, comprising Reptiles and Birds: and (3.) the MAMMALS, devoid of branchiæ, and with an amnion and an allantois, but with two occipital condyles, and a well-developed basi-occipital, and no parasphenoid, a simple mandibular ramus, articulated with the squamosal, and not with the quadratum, with mammary glands, and with red non-nucleated blood-corpuscles.'—*Op. cit.*, p. 74.—For further details, the reader may consult Stannius's *Comparative Anatomy of the Vertebrata* (in German), Wagner's *Comparative Anatomy of the Vertebrata*, translated from the German by Tulk; the works of Huxley and Owen quoted in this article; and the special departments of Cuvier's *Règne Animal*, and Blanchard's *L'Organisation du Règne Animal*, now in course of publication—a work which, if ever completed, will rival Cuvier's *opus magnum*.

VERTI'GO, in Medicine, designates a sensation which the patient describes as one of going to fall, or of turning round, or of everything turning around him. It comes on without premonitory symptoms, excepting a sense of disturbed balance, which may either precede, accompany, or follow it. Associated with it are frequently some of the following symptoms: flashes of light before the eyes, buzzing in the ears, painful sensations in the head, nausea, vomiting, trembling with cold perspirations, muscular tremors, a full, slow, or small and frequent pulse, flushing or pallor of the face, and cold feet.

Giddiness and *dizziness* are only other names for vertigo, although giddiness is commonly applied to its milder forms. Attacks of it come on in paroxysms, usually repeated several times a day, and lasting from a few minutes to a quarter of an hour. This disease is frequently chronic, the chief predisposition to it being in middle and advanced age. Childhood is nearly exempt from it, an observation in accordance with the well-known fact, that children can bear rapid rotatory movements without the induction of giddiness better than adults. A plethoric constitution, especially if associated with a sedentary mode of life, the so-called change of life in women, the debility brought on by exhausting discharges, and the abuse of spirituous liquors, may be regarded as predisposing causes to this affection. The direct cause of vertigo is doubtless an irregularity of the supply of blood to the brain. Hence any condition that occasions either an increase or diminution in the supply of blood, is followed by vertigo. For example, it commonly accompanies disease of the heart, and especially hypertrophy of the left ventricle; it is also induced by suppressed hæmorrhoids, or other constant form of discharge or loss of blood. Injuries and diseases of the brain, and especially of the cerebellum, are often accompanied by this symptom, and so also are diseases of the spleen. Amongst the most common exciting causes are intoxication, not only from alcoholic drinks, but from narcotics, such as smoking tobacco, inhaling carbonic acid gas, or semi-poisoning by belladonna, digitalis, hyoscyamus, &c., gorging the stomach with indigestible food (especially if highly carbonated drinks are at the same time taken); unusual movements or positions of the body, and especially of the head, as in sea-voyages, continued stooping, &c.

There is a peculiar kind of vertigo which occurs in dreams. The direction of the apparent movement is generally from above downwards; dreams of tumbling down stairs being, according to Romberg, the most common; people also dream of sinking into the earth, of chasms opening before them, &c.

According to Boerhaave, 'vertigo is the most easily cured of all the diseases of the head.' This statement is too positive; the vertigo that is caused by profuse discharges and exhaustion is curable,

while it is beyond the aid of treatment when it accompanies cerebral disorganisation. The *treatment* of course depends upon the cause; while in some cases tonics (the mineral acids, small doses of nux vomica, quassia, &c.) are required, in others, the local abstraction of blood from the nape of the neck, cold affusion, &c., are required. The following rules are, however, generally applicable for the treatment of patients subject to giddiness. They should avoid violent, continuous, or rotatory exercise, abstain from highly nutritious or heating articles of diet, and from suppers; they should not indulge in much sleep, r the use of feather-beds, or of warm baths. Counter-irritation to the skin by sinapisms, foot-baths with mustard, the use of the flesh-brush, with cold washing of the body, and the administration of cooling laxatives, are to be recommended. (A good laxative of this kind is obtained by mixing six drachms of sulphate of magnesia [Epsom salts] with two drachms of carbonate of magnesia, and taking a tea-spoonful three times a day.) When the patient feels the attack coming on, Romberg directs that he should 'direct his full attention to movement. The patients do this, in a measure, of their own accord, by supporting themselves firmly with their hands and feet, in order to resist the illusory movement. The sense of vision may be employed for the same purpose; thus, the vertigo produced by rotatory movement of the body may be suppressed by looking steadily at the finger held up to the eye, or by turning round in a direction opposite to the previous movement.'—*On Diseases of the Nervous System*, Syd. Soc. Ed. vol. i., p. 102.

Few of our readers are probably aware of the remarkable vertiginous conditions which they can artificially induce in their own persons. Purkinje, the well-known anatomist and physiologist, was the first who brought these remarkable facts within the range of experimental science in two Memoirs published in 1820 and 1827. Vertical vertigo is thus produced. The experimenter—who must be standing—has a somewhat heavy weight attached to each hand, and as he carefully watches the sensation produced by gravitation for some time, he feels the weights growing heavier and heavier, till he can no longer bear them. On putting them down, when he feels he can bear them no longer, it appears to him as if he was impelled to mount straight upwards, and as if the arms were shortened, and the hands must creep up to the thorax. Similar experiments with the muscles of the eye afford still more striking results. 'If the face,' says Purkinje, 'be turned to the ceiling, and the eye be fixed on a given point, round which, as the pole of a vertical axis, the body is turned a certain number of times, the visible objects of the ceiling, as well as the floor of the room, will, if the position of the head and the direction of the eyes be maintained, appear to move in a horizontal direction. If, during the proceeding, the head be brought back into the ordinary upright position, the horizontal will be turned into vertical vertigo; and this sensation will be communicated to the tactile sense of the hands and feet, the floor appearing to sink down on one side, and to rise on the other.'—See Rust's *Magazine*, &c., 1827, vol. xxiii. p. 290.

An analogous effect is produced by standing on the brink of, or in, a running stream, and fixing the eyes on the water; after a time, the sensation begins all at once of being borne along against the current. When this sensation comes on in wading in a river, it is very difficult to keep one's feet; and hence it is dangerous to let the eyes rest on the current close by.

Hitherto, we have spoken of vertigo merely as a sensation; but there are certain morbid conditions of the brain, and certain operations which experimental physiologists can perform upon it, that will give rise to what may be termed *vertiginous movements*, if we include under the term vertigo *straight* as well as circular movements, as is usually done by writers on this subject. From the experiments of Magendie and Flourens, which have been confirmed by Krauss and Hertwig, it follows that: 1. Removal of both corpora striata of the brain induces an irresistible tendency to advance, the animal shooting straight forward like an arrow; 2. Slicing the cerebellum, whether horizontally or vertically, causes the animal to walk backwards; 3. Section of the corpora quadrigemina of one side, and of one side of the pons varolii, excites rotatory movements and gyrations of the animal towards the injured side; while division of the corresponding parts on the opposite side restores the balance. Vertiginous movements consequent on disease were described by the veterinary surgeons in sheep before they were noticed in the human subject. The *Cœnurus cerebralis*, which is now known to be the larva of a species of tapeworm (*Tænia cœnurus*) infesting the dog, is the well-known hydatid in the brain of sheep, producing in that animal the disease known under the various names of staggers, turn-sick, goggles, rotatory disease, &c. How this hydatid excites these movements when it destroys certain parts of the brain, is now explained by the experiments previously noticed. Dr Romberg has collected a number of very interesting cases of vertiginous movements in the human subject.—On this subject, in addition to Romberg's work, the reader may consult a paper by Dr Paget, 'On Morbid Rhythmical Movements,' in the *Edin. Med. and Surg. Jour.*, 1847, vol. lxvii.; and the remarks of Dr Carpenter (in criticism of some of Magendie's conclusions) on the Cerebellum and its Functions in his *Human Physiology*.

VERTUE, George, distinguished as an English engraver and antiquary, was born in London in the year 1684, of poor but respectable parents. At the age of 13, he was set to study under an eminent French engraver there; subsequently, he became a pupil of Michael Vandergucht, with whom he remained seven years, and in 1709, he commenced business for himself. He was generously befriended by Sir Godfrey Kneller, the great portrait-painter of the day, who did much to procure him employment. His talent soon made itself recognised; and his eminent success in an engraved portrait of Archbishop Tillotson, for which he received a commission from Lord Somers, at once placed him in the very front rank of his profession. In 1711, on the institution of the Academy of Painting, with his friend Sir Godfrey Kneller as president, he enrolled himself as a member; but his contributions were few and unimportant. In his own more special department, he wrought through life assiduously, confining himself for the most part to reproductions of the portraits of Kneller, Richardson, and one or two others of the more eminent painters of the day. On the accession of George I., he issued a large engraved head of that monarch, which had an immense run, much increasing his reputation with the public. Himself, from an early period, devoted to antiquarian research, which from time to time he prosecuted in journeys hither and thither throughout England, he was appointed, in 1717, Engraver to the Society of Antiquaries, in which capacity he worked up to the time of his death, which occurred on 24th July 1756. He lies buried in the cloisters of Westminster Abbey. In addition to his eminence in his art, he was a man of considerable general

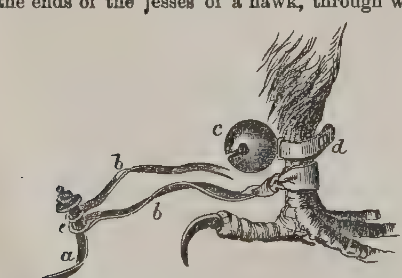
accomplishment; an adept in drawing and music, and with a competent knowledge of the French, Dutch, and Italian languages. He projected a *History of the Arts in England*, and had accumulated masses of material for it. At his death, his manuscripts were bought by Walpole, who made free use of them in his *Anecdotes of Painting in England.* In a supplementary volume of that work, entitled *A Catalogue of Engravers who have been born or resided in England*, a full list of his works is given, with some interesting notices of his character, the genuine unassuming worth of which is indicated in an unaffected expression of respect, of rather more than usual significance, as coming from the caustic and supercilious Walpole.

VERTU'MNUS. See POMONA.

VE'RVAIN (*Verbena*), a genus of plants of the natural order *Verbenaceæ*, with a 5-cleft calyx, one division a little shorter than the rest, the limb of the corolla irregularly 5-lobed, the stamens (4 or 2) included within the corolla, the fruit a 4-seeded utricle, which soon breaks, so that the ripe fruit consists of four adherent achœnia. The species are herbaceous plants and small shrubs, with undivided, trifid, or multifid leaves, natives chiefly of the warmer temperate parts of the world. The Common V. (*V. officinalis*), a perennial plant, with erect somewhat hispid stem, rough lanceolate inciso-serrate or trifid and laciniate leaves, and filiform spikes of pale lilac flowers, is a native of Britain and of most of the temperate countries of the world. It is a common ornament of flower-borders, continuing to blossom all summer. It had at one time a very high reputation as a medicinal plant, but its virtues are now regarded as imaginary. It has also been connected with some of the superstitious rites of different nations, as of the Greeks and Romans, the ancient Persians, and the British Druids.—A number of species of V., chiefly American and East Indian, are occasionally cultivated for the beauty of their flowers.

Verbena officinalis.

VE'RVELS, or VARVELS, small rings attached to the ends of the jesses of a hawk, through which



a, the end of leash; b, b, the jesses; c, the bell; d, the bewit; e, the varvels of silver, with owner's name and address engraved.

a string was passed to fasten them to its leg. They occur as a heraldic charge.

VERVIERS, a prosperous manufacturing town of Belgium, in the province of Liége, most picturesquely situated on the river Vesdre, 15 miles east-south-east of Liége, on the Brussels and Cologne Railway. It is of recent growth, and being composed wholly of workshops and of the dwellings of the manufacturers and their workmen, there are no remarkable objects of attraction. V. is the great centre of the second-rate cloth-manufactures in Belgium. In and around the town, there are 60 cloth-mills, employing 40,000 hands and 155 steam-engines. The exports of cloth to Switzerland, Italy, and America are valued at £1,000,000 a year; and the goods, which are chiefly coarse woollens, are said to be better and cheaper than those of either France or England. The waters of the Vesdre possess qualities which render them admirably fitted for dyeing. Pop. (1879) 40,362.

VESALIUS, ANDREW, the celebrated anatomist, was a native of Brussels, where he was born in 1514. He studied classics at Louvain, and anatomy and medicine first at Cologne, then at Montpelier, and finally at Paris, where his preceptors were Gunther, Sylvius and Fernelius. So keen was his love of dissection, that in order to procure subjects (at that time no easy matter), he ran considerable risks at the hands of the municipal authorities. Driven from Paris by the outbreak of war between Francis I. and Charles V., he returned to the Low Countries, where he served as physician and surgeon in the imperial army from 1535 to 1537. In 1539, he went by invitation to Pavia, where he taught anatomy till 1543. From Pavia he went, again as a lecturer in anatomy, to Bologna and Pisa; and in 1544 was made physician-in-chief to Charles V. at Madrid, where he continued mainly to reside. He was now at the zenith of his prosperity, when an accident befel him which brought his career to a premature and disastrous close. A Spanish gentleman died in 1564, and permission to dissect the body was granted by his relatives to Vesalius. Life, however, was ascertained to be not quite extinct when V. began the operation, the heart being found still palpitating. The family of the deceased, with inconsiderate vindictiveness, arraigned V. before the Inquisition, by which tribunal some terrible sentence would have been passed upon him, but for the interposition of Philip II., who procured for the unfortunate anatomist the milder penalty of an injunction to make a pilgrimage to the Holy Land. V., accordingly, in the train of the Venetian General Malateste, proceeded to Cyprus, and thence to Jerusalem. While sojourning in that city, he was invited to occupy the chair of Anatomy, just vacated in Padua by Fallopius. It is supposed that, in compliance with this invitation, he embarked for Europe; but the ship in which he sailed was wrecked on the shore of Zante. Hunger and misery of mind proved too much for him, and he died in a village of that island in 1564.

V. was one of those men of science who contributed to disenthral the minds of his contemporaries from their servile belief in the ancients. Galen was then to anatomy what Aristotle was to logical method; and V. assailed his authority by independent researches into nature. His first great publication was a series of anatomical tables entitled *Suorum Librorum de Corporis Humani Anatome Epitome* (Basel, 1542, fol.). The plates, from drawings by the best masters, and engraved on wood, were nearly all re-incorporated in his great work *De Corporis Humani Fabrica Libri Septem* (Basel, 1543). Great value is placed on the earliest impressions of these plates, the explanations of which, however, were revised by V. in his second (Basel) edition in 1555. He published in 1546 his severe attack on the errors of Galen's anatomy, the well-

known *De Radicis Chinæ usu Epistola.* The cause of Galen was then espoused by Galen's disciple, Fallopius, to whom V. replied in his trenchant *Anatomicarum Gabrielis Fallopii Observationum Examen* (1561). After his death, a work entitled *Chirurgia Magna*, published under his name, but really a compilation from the ancient anatomists, was edited by his disciple Borgarucci. The great edition of V.'s works appeared with fine plates at Leyden in 1725, 2 vols. fol., under the superintendence of Boerhaave and Albinus.

VE'SICANTS, or BLISTERING AGENTS, are substances which, if kept in contact for some time with the surface of the body, excite such irritation as to cause the effusion of serum from the true skin, leading to the separation and elevation of the cuticle, and the formation of a vesicle or blister. They are employed in the practice of medicine for the purpose of relieving or removing the diseased condition of some internal part, by producing a determination of blood from the interior to the surface over the seat of the affection. They likewise are of great value from their action as general stimulants to the system, and as such are often used with great benefit in the advanced stages of low continued fever. Moreover, they are not unfrequently employed for the direct purpose of withdrawing serum from the vascular system, and with this view they are prescribed with advantage in cases of sudden effusion into the pericardium or the pleura. Blisters used with this object should be of large size, and should be kept in contact with the skin sufficiently long to produce their full effect (twenty-four hours being in some persons necessary for that purpose). Lastly, vesicants are occasionally applied to the surface of the body, for the purpose of removing the cuticle, so as to permit the direct application of various medical agents (especially mercury and morphia) to the absorbing surface of the true skin. It must be recollected that in infancy and childhood, owing to the extreme readiness with which inflammation of the skin is then set up, these agents must be used with extreme caution.

To produce vesication, *cantharidine*—the active principle of *Cantharides*, or Spanish Flies—in one of its various forms is generally employed, although other substances, afterwards to be noticed, are occasionally used. Cantharidine is a white crystalline substance, which is extracted from the powdered insects by rectified spirit, and whose composition is represented by the formula $C_{10}H_6O_4$. It is a very active poison, and produces immediate inflammation of the skin whenever it comes in contact with it, is very volatile, even at ordinary temperatures, and is soluble not only in alcohol, but in chloroform, ether, strong acetic acid, and many oils. This substance is employed in the form of plaster (*Emplastrum Cantharidis* of the *Pharm. Brit.*), blistering fluid (of which there are several excellent forms, such as *Acetum Canth.*, *Æther Canth.*, and *Collodion Canth.*, none of which are in the *Pharm. Brit.*), and blistering tissue (of which there are several forms, known as *Tela vesicatoria*, *Charta ves.*, *Blistering Cloth*,* &c., none of which are officinal). Although the fluids and tissues are the cleaner and neater preparations, the old-fashioned *Cantharides Plaster* is far the most commonly employed in general practice, and is, by many of the authorities in the profession (amongst whom we may name Professor Syme of Edinburgh, and Professor Lister of Glasgow), considered as the most efficacious (its superiority being due to its slower and more prolonged action). In prescribing a blister, it is expedient to sketch the size and shape desired. Before applying it, the skin should be well washed with warm water. If the patient's skin is not easily acted upon, the part should be sponged with vinegar; while if it is very susceptible, and he is liable to strangury from the application of blisters, a piece of tissue-paper should be placed between the skin and the plaster. (In speaking of the plaster, which is a solid mass, we assume that it is spread on some fitting material as wash-leather, soft brown paper, &c., the popular idea of a plaster always including the material on which it is spread.) In order to insure close contact with the skin, the blister should be gently warmed, carefully applied, so as to avoid creases, and kept in its place by a bandage. To produce their full action, blisters should remain from ten to twelve hours, and if on their removal after that time full vesication has not been produced, a hot bread-and-water poultice will often produce the desired effect. The raised cuticle should be punctured, to allow of the escape of the serum (except in the case of children and persons of very irritable skin, when the vesications should be left unopened), and a dressing of simple ointment or spermaceti ointment on soft rag applied, and repeated in twenty-four hours afterwards; or the part may be at once covered with cotton-wool, which, until it gives off a bad smell, can remain till the skin is healed. The troublesome *itching* which often follows the application of a blister, is best relieved by the application of a bread-and-water poultice, moistened with the dilute solution of acetate of lead, formerly known as Goulard's *Vegeto-mineral Water.* Dr Neligan, in his highly practical work *On Medicines*, speaks so strongly of *Collodium Vesicans* as a blistering agent, that although we have no personal experience of it, we shall, on his authority, briefly notice it. It is prepared, when required, by mixing together equal parts of collodium and cantharidal ether (obtained by digesting for three days one part of coarsely powdered cantharides in two parts of sulphuric ether, and expressing). It possesses the advantage that its strength can be readily increased or diminished. 'It is now much used for blistering,' he observes, 'owing to its cleanliness, its certainty, and the facility with which it may be applied in the neighbourhood of joints, or to other parts which are difficult to blister by the ordinary method. It is applied with a camel-hair pencil; two scruples are sufficient to blister a surface as large as the palm of the hand. It is preferable to apply the quantity to be used twice, instead of at one time, on the place to be blistered.'

When a blistering agent with very rapid action is required, as in the state of collapse in cholera, recourse may be had to the application of boiling or nearly boiling water* to a portion of the abdomen, the surrounding surface being protected by a wall of damp cloths; or in less urgent cases, as retrocedent gout shewing itself internally, an almost immediate blister may be produced by saturating a piece of lint of the size of the desired blister in the strong solution of ammonia, and applying it to the skin

* We have not included the well-known *Papier d'Albespeyres*, which is often sold for this purpose, because it is not sufficiently powerful. It is useful for keeping open an already blistered surface.

* Strange and paradoxical as it may appear, 'in the absence of other more suitable means, *cold water* may be used as efficiently as boiling water, and will not present so formidable an appearance to the patient. A piece of bibulous paper (common blotting-paper, for example) should be soaked in cold water, applied to the part to be vesicated, and covered with three or four folds of dry paper. A common smoothing-iron heated to 212° should now be pressed three or four times over all, and on removing the paper, the part will be found vesicated.'—Neligan, *op. cit.*, p. 325.

with moderate pressure. By the time that the ammonia has evaporated, the required result is usually obtained. When it is desired to keep up a discharge from a blistered surface (instead of healing it, as is most commonly required), or to produce a *perpetual blister*, we dress the raw surface with irritants of various kinds, such as savine ointment, *Papier d'Albespeyres*, &c. At each fresh dressing, which in summer should take place twice a day, the part should be cleansed with warm water.

VESICA PISCIS (barbarous Lat. bladder fish, bladder evolved out of a fish), a term often, but not very correctly, used for the aureole or glory, of a pointed oval shape, formed by the intersection of two circles, which, in the religious symbolism of the early middle ages, is often represented encircling the whole body of the Saviour. This form is supposed

Vesica Piscis.

to have been gradually evolved out of the figure of the fish, which is prominent in the symbolism of the early Christians on sarcophagi and elsewhere, and whose use arose out of an anagram on the initial letters of Ἰησοῦς Χριστὸς Θεοῦ· Υἱὸς Σωτήρ, Jesus Christ, son of God the Saviour. The ovoidal form, generally designated by English antiquaries the Vesica Piscis, is much used in painted glass, and became from the 12th c. the almost invariable form of the seals of ecclesiastical persons and institutions.

VESOUL, a small town in the east of France, capital of the dep. of Haute-Saône, stands in a fertile and picturesque country, overlooked by the mountain called the Motte-de-Vesoul, on the Durgeon, 236 miles east-south-east of Paris. The manufactures of the town are unimportant, but the environs are as fertile as they are beautiful; the slopes of the Motte-de-Vesoul are clad with vines; and a trade in grain, hay, and hides is carried on. Pop. about 10,000.

VESPASIA'NUS, Titus Flavius, Roman emperor, was a native of Reate, in the Sabine country, of humble origin. After serving with distinction in various military grades in Thrace, Britain, and Africa, he was sent by Nero to conduct the Jewish war. This appointment he owed to his recognised merits, for he was not a favourite with the emperor, whom he had offended by falling asleep during the recitation of one of his poetical compositions. He conducted the war with vigour, reduced Judæa, and finally laid siege to Jerusalem. At this time occurred the struggle for the imperial dignity between Otho and Vitellius, after the murder of Galba. The legions serving in the East were indignant that the empire should be disposed of at the will of the Prætorian Guards. Their own general was proclaimed emperor, and quickly acknowledged as such by all the East, and, after the death of Vitellius, by Italy and all the provinces. Leaving his son Titus to prosecute the siege of Jerusalem, he repaired to Rome, where he was joyfully received, and immediately set about the work of restoring order. He kept his soldiers under firm discipline, improved the finances, co-operated cordially with the senate in the administration, and did much by his example to lessen the ill effects of the prodigality and luxury of his predecessors. An interesting biography of him has been written by Suetonius, and from the personal anecdotes there recorded, we are enabled to estimate clearly the character of the man. He was simple and unostentatious in his mode of life, too shrewd to listen to flattery, liked a joke, was good-humoured, and easy of access. He is charged with being avaricious, and at times he certainly sought to obtain money by rather undignified ways; but though niggardly in personal expenditure, he was lavish in embellishing the city with public works, and a munificent patron of the arts and sciences. He is chargeable also with one or two acts of cruelty, but usually he bore provocation with great good temper. He died 79 A.D., in the 69th year of his age, after a reign of ten years.

VE'SPERS (Lat. *vespere*, in the evening), one of the canonical hours of the Breviary, called also anciently *Lucernarium*, from *lucerna*, a lamp. It is a service of very ancient use, being plainly referred to in the apostolical constitutions, and is noticeable as that one among the canonical hours which in the Roman Catholic Church continues to be regularly sung as one of the ordinary public services of parish churches, no less than in cathedrals where the entire of the hours are chanted. It resembles lauds, and consists of five psalms and antiphons, a lesson, a hymn with versicle and response, a canticle (the Magnificat), and a collect or prayer. The psalms sung at vespers are Ps. cix.—cxlvii., which are distributed over the several days of the week. The service of vespers has given occasion to some of the most brilliant efforts of modern musical composers. The Evening Prayer of the English Prayer-book corresponds partly with the vespers, partly with the compline (*completorium*) of the Roman Breviary.

VESPUCCI, Amerigo. See Amerigo Vespucci.

VE'STA, VE'STALS. Vesta, an ancient Latin divinity, whose worship was the embodiment of an idea, deeply rooted in the Latin, and particularly, in the Roman mind—viz., that the state was one great family. As the Lares were the tutelary guardians of the individual household, so the Penates and Vesta watched over the welfare of the state. The Greek *Hestia* (hearth) is a kindred conception; and if the word is the same, it may be conjectured that the worship of the chaste divinity that presided over domestic life goes back to a period when the Greeks and Latins were still an undivided people. The state, we have said, was regarded by the Latins as one great family, so each community had its public

Vesta.

altar to Vesta, the central one for the whole Latin people being at Lanuvium, about 20 miles from Rome, on the Appian Way, where the Roman consuls and other officers offered sacrifices on entering upon their offices. The common hearth of the Greeks was at Delphi. There was also a temple of Vesta at Rome, which stood in the Forum, near the temple of the Penates (see LARES, &c.), between the Palatine and Capitoline hills; it was open during the day, and closed during the night. On the first of March each year, the sacred fire was renewed; on the 9th June, the *Vestalia* were held in honour of the goddess; and on the 15th of that month, the temple was cleared out, and the dirt carried into a narrow lane (*angiportus*) behind the temple, which was locked by a gate, that none might enter.

The goddess herself was a virgin, and her fire was carefully tended night and day by the *Vestal* virgins. The number of these priestesses was originally four, but two were subsequently added, increasing the number to six. At first, they were chosen by the kings; but after their expulsion, by the Pontifex Maximus, who, when a vacancy had to be filled up, selected twenty damsels between the ages of six and ten years, from among whom one was chosen by lot. A father could offer his daughter for the office, if he chose, but this seldom happened. The necessary qualifications for the office of Vestal were, that the maiden should be the daughter of free-born parents, then alive and resident in Italy, and engaged in no dishonourable occupation; that she herself should not be younger than six, nor older than ten years, and free from any physical defect. The period during which the priestess was bound to the service of Vesta was thirty years, the first ten being occupied with learning her duties, the next in performing them, and the last in teaching them to others. When she entered upon her office, the Vestal took upon herself a solemn vow of chastity for the thirty years of her service, the dreadful punishment of a violation of which was, that she should be buried alive in a subterranean vault near the Colline Gate, to which she was carried on a bier, as if dead, and where she found a light, with a scanty supply of bread, water, milk, and oil. The chief duty of the virgin priestesses was to keep the fire on the altar of the goddess ever burning; they had also to present offerings to Vesta, sprinkle the temple every morning with water drawn from the Egerian well, and guard the sacred relics, which were a pledge granted by fate for the permanency of the Roman sway. As the extinction of the sacred fire was looked upon as emblematic of the extinction of the state, the Vestal who, by neglect of duty, allowed this to happen, was severely punished, the penalty being, that she should be stripped and scourged by the pontifex in the dark: the fire was again rekindled by the friction of two pieces of wood from a 'lucky tree.'

As a compensation for the strictness of the lives which they had to lead, the Vestals had many privileges bestowed upon them: among others, they were entirely freed from paternal authority; could make a will, and give evidence without taking an oath; had a seat assigned them in the best part of the theatre; were held in the greatest honour, and done homage to by the highest officers of the state; and even the plebs, in their most reckless moments, respected them. If, when out walking, their eye should chance to light upon a criminal, he was set free. At the expiration of her period of service, a Vestal, if she chose, could marry, although to do so was considered very unlucky, so that she generally ended her days in the service of the goddess.

VESTI'BULUM, a porch or ante-room, from which a house or large apartment is entered.

VE'STMENTS, SACRED, the peculiar habiliments worn by ministers of religion in the public discharge of their office, and sometimes in other sacred ministrations, even when privately performed. The use of a distinctive costume in public worship formed a part not only of the Jewish, but of almost all the ancient religions, and has been found in a greater or less degree in the religions of the new world. See Lipsius, *De Monument. et Exemp. Polit.*, l. i. c. 3. The whole 28th chapter of Exodus is taken up with a description of the vestments of the high-priest; and the directions for those of the inferior functionaries are almost equally minute. Whether the same characteristic was carried into the early Christian worship, has been a subject of controversy; some writers being of opinion that the peculiar sacred costume which we find in use among Christian ministers from a very early period was not originally peculiar to the clergy, but was simply the ordinary costume of Rome and of the East in the first centuries, and only came to be a costume distinctive of sacred ministers, because by them it was retained unaltered, whereas in the every-day world the costume varied in fashion, in material, in colour from year to year. There seems little room, however, for doubting, that from a very early time Christian ministers did employ some distinctive dress in public worship; and Catholic writers even find traces in the beginning of the 5th c. of the practice of blessing the vestments which were destined for the public services of the church. See Binterim, *Denkwürdigkeiten*, IV. i. p. 198. From the 8th c. downward, the rituals of the West all contain formularies for the blessing of the several sacred vestments worn by bishops, priests, deacons, and lower clergy. The vestments used in the celebration of the mass by priests of the Roman Catholic Church are six in number—viz. (1) the amice, a square piece of linen, which is worn upon the shoulders, and in some of the religious orders, over the head, which latter, indeed, appears to have been the ancient mode of wearing it; (2) the alb, a long, loose-sleeved, linen gown, sometimes richly embroidered or 'apparelled' at the lower border; (3) the cincture, a linen cord tied around the waist, and confining the folds of the alb; (4) the maniple, a narrow strip of embroidered silk, worn pendent from the arm; (5) the stole, a long narrow scarf, similarly embroidered, and worn by priests around the neck, the ends being crossed over the breast or pendent in front, and by deacons transversely over one shoulder; (6) the chasuble, a loose flowing vestment, open at the sides, having a hole in the centre, through which the head passes, and falling down over the breast and back to some distance below the knees. Most of these vestments have been already briefly described. The three last named are always of the same material and colour; but this colour, which appears primitively to have been in all cases white, now, and for many centuries, varies according to seasons and festivals, five different colours being employed in the cycle of ecclesiastical services—viz., white, red, green, violet, and black. Cloth of gold, however, may be substituted for any of these, except the last. A cap, called *biretum*, is worn in approaching the altar, but is laid aside during mass. Besides these vestments, which are worn by priests during the mass, bishops in the same service use also two inner vestments, of nearly the same form as the chasuble, called 'dalmatic' and 'tunic,' as also embroidered gloves and shoes, or buskins, together with the distinctive episcopal ornaments—the pectoral cross, the mitre, the pastoral staff, or,

if archbishops, the crosier, and ring. Archbishops celebrating mass also wear the Pallium (q. v.). Deacons, at the same service, wear a robe, called dalmatic; and sub-deacons, a tunic. The sub-deacon is not privileged to wear the stole. In other public services, priests and bishops wear a large flowing cloak, called cope (Lat. *pluviale*), with a pendent cape or hood, called orfrey. In the ministration of the other sacraments, and also in administering communion, priests wear the surplice (which is but a short alb) with the stole. The vestments of the Greek priests differ considerably in their general character and effect from those of the Latin clergy, but the several portions of the costume are substantially the same as those of the Latin costume already described. The *stoicharion*, the *zoné*, the *orarion*, the *epimanikia*, and the *phelorion*, correspond respectively with the alb, cincture, stole, maniple, and chasuble. Greek bishops wear the *omophorion*, which corresponds with the later pallium. The *phelorion*, however, is so ample in its folds as to resemble the Latin cope rather than the chasuble; and the general effect of the Greek vestments, which may be said to resemble in all particulars that of the other Eastern rites, is much more picturesque.

The natural effect of the religious changes of the 16th c. was to put aside the costume at the same time and on the same grounds with the ceremonies of the existing worship. This was done, however, by the different churches of the Reformers in very various degrees. The Calvinistic worship may be said to have dispensed with vestments altogether. The Lutherans generally retained with the cassock the alb, and in some countries the chasuble. In the English Church, a variety of practice has existed. The disputes about the use of the Surplice (q. v.) have been already described. As to the rest of the costume, the first Prayer-book retained the Roman vestments with little change; and as, by a remarkable accident, the rubric of this Prayer-book has never been formally repealed, a so-called ritualistic movement in the English Church has re-introduced in some places almost every detail of the Roman costume in the communion and other services, an innovation which has in many instances been vigorously resisted.

VESTRY, in English parishes, is a meeting of the inhabitants of the parish assembled to deliberate on some matter which they have a right to decide (see PARISH). The vestry is the regular organ through which the parish speaks; and in numerous matters relating to church-rates, highways, baths and wash-houses, and other sanitary matters, it has important functions to discharge, and is a conspicuous feature of parochial management. A statute was passed in 1818 to regulate the mode of procedure. No vestry, or meeting of inhabitants in vestry, shall be held until public notice of the place and hour of meeting be given, as well as of the special purpose of such meeting. This notice is required to be given by publishing it on some Sunday during, or immediately after, divine service, by affixing a written or printed copy on the principal door of the parish church or chapel. Such notice is to be previously signed by a churchwarden of the church or chapel, or by the rector, vicar, or curate of the parish. These meetings were formerly held in the vestry-room of the church, hence the name given to the meeting itself. In large parishes, the vestry-room of the church was found too small; and wherever the population exceeds 2000, the vestry may apply to the Poor-law Board to have some room, or other place of meeting than the church, built or hired for the purpose of the vestry-meetings. The minister of the parish—that is to say, the rector, vicar, or perpetual curate—if he be present, is entitled to be the chairman; but if he be not present, then the meeting may nominate one of the inhabitants to be chairman. The chairman has the power of adjourning the meeting, but he must exercise such power prudently, and so as to facilitate the business. None but persons rated to the relief of the poor can vote in a vestry; and though formerly none could vote unless actually residing in the parish, this is no longer necessary, provided the person is rated to the poor of the parish. The number of votes depends on the rental or value of the occupation, one vote being allowed for each £25 of value, or rental, provided that no person shall have more than six votes. In case of joint occupiers, each votes according to his own share of the joint value. One of the incidents of holding a vestry is, that any vestryman, after a show of hands is taken, may demand a poll, and if the poll be refused, the resolution come to is void. The law has surrounded this parochial right to a poll with jealous care; and if there is not fair play given, and ample notice and time for all the inhabitants entitled to vote to come and give their vote, the whole proceedings are void. It is the duty of the churchwardens and overseers to keep a book in which to enter the minutes of the vestry. The vestry appoints annually church-wardens and highway surveyors, and nominates overseers. A church-rate can only be made by a vestry, and if the majority choose to make none, then no rate is possible. The vestry also deliberates and resolves as to stopping up, diverting, or turning highways; whether the owners of small tenements ought to be excused from paying poor-rates; whether baths and wash-houses, parish libraries, etc., shall be adopted. In large parishes, a vestry clerk is usually appointed, and paid out of the poor rate; and in such case he is appointed by the vestry. His duty is to give notices of all vestry meetings; to summon the church-wardens and overseers; to keep the minutes, accounts, and vestry-books; to make out the church rate; recover arrears of rates; make out lists of persons qualified to act as jurymen, and to give notices for claims to vote for members of parliament. Some parishes are governed by a select vestry, which means a small part of the chief inhabitants appointed by justices of the peace under a statute, and their duty consists of relieving the poor, and they supersede the common vestry of the parish.

VESU'VIAN, or IDOCRASE, a mineral, allied to garnet, and sometimes called *Pyramidal Garnet.* It is found in volcanic and in primitive rocks. It is frequent in masses ejected from Vesuvius, whence its name. The hardness is about equal to that of quartz. The colours are various—yellow, green, brown, almost black, rarely azure. V. is composed of silica, alumina, and lime, in somewhat varying but not very unequal proportions, with a little oxide of iron and oxide of manganese. It is employed as an ornamental stone, but is not very highly valued. The green-coloured varieties are known as *Volcanic Crysolite*, and the brown as *Volcanic Hyacinth.*

VESU'VIUS, a well-known volcano, is situated near the east shore of the Bay of Naples, about ten miles from the city of that name. It is a solitary mountain, rising majestically from the plain of Campania, having at the base a circumference of about 30 miles, and dividing, at a certain height, into two summits, Somma and Vesuvius Proper. The height of the mountain and form of its apex are subject to frequent changes by eruptions. It is estimated to be at present nearly 4000 feet high

In the single eruption of 1822, it lost 800 feet, nearly all of which has been restored by subsequent eruptions. Before that event, the summit was a rough and rocky plain, covered with blocks of lava and scoriæ, and rent by numerous fissures, from which clouds of smoke were given out. But it was then altered to a vast elliptical chasm, three miles in circumference, three-quarters of a mile at the greatest diameter, and about 2000 feet deep.

The first recorded eruption took place in the year 79 A.D. Warnings had been given 16 years before by a great earthquake, which shattered the cities of Herculaneum and Pompeii, and the earth was frequently shaken by slight shocks until August of the year 79, when they became more numerous and violent. Previous to this, V. was not suspected to be a volcano. Its sides were covered with famous vines, and its ancient crater, partly filled with water, formed the stronghold of the rebel chief, Spartacus. The morning of 24th August brought comparative repose; but in the course of the day, a huge black cloud rose from the mountain, from which stones, ashes, and pumice were poured down on all the region around. The elder Pliny, who commanded the Roman fleet at Misenum, sailed to the help of the distracted inhabitants: he landed near the base of the mountain, was enveloped in sulphurous vapour, and was suffocated. The younger Pliny gives a graphic account of the eruption in two letters to Tacitus, which are well known. No lava was ejected on this occasion, nor indeed in any eruption in historic times up to the year 1066. Pompeii was buried under a thickness of 20 feet of loose ashes, and remained unknown till about a century ago. A torrent of mud spread over Herculaneum, which, by additions from subsequent repeated eruptions, now forms a thickness of 80 or 100 feet. Since this first famous eruption, V. has been an active volcano, and has been frequently but irregularly in eruption, about 60 great and numerous smaller ones having taken place. In 472, the eruption was so great that the ashes fell even at Constantinople, and caused great alarm there. The summit known as Monte Nuovo was, in 1538, forced up in two days to the height of 413 feet, and with a circumference of 8000 feet. In 1631, the villages at the foot of the mountain were covered with lava, and torrents of boiling water were sent forth. Since that described by Pliny, the most famous is the eruption of 1779, of which Sir William Hamilton, then British minister at Naples, gives a long and interesting account. In the spring of that year, it began to pour forth lava; this was succeeded by rumbling noises and puffs of smoke; then jets of red-hot stones and ashes made their appearance, and increased in number and intensity, until the eruption arrived at its climax between the 5th and 10th of August. Then enormous volumes of white clouds rose from the crater to a height four times that of the mountain, and lava poured from the crater in torrents down the sides of the cone. This was followed by columns of fire, which rose on some occasions to three times the height of V., or more than two miles. In the midst of all this, showers of stones, scoriæ, and ashes were thrown out to a great height. One mass of rock ejected was 108 feet in circumference, and 17 feet high. A more terrible eruption took place 15 years later, by which the greater part of the town of Torre del Greco was destroyed. The violent eruption of 1822 has already been alluded to. One of the most remarkable of the recent eruptions was that of May 1855, when vast floods of lava poured down the sides of the mountain, spreading desolation in every direction, and destroying the village of Cercolo. Before its close, 11 cones were in active operation, the discharge from which was so great that at one time a total falling-in of the mountain was dreaded.

Foro Civile at Pompeii, with Vesuvius in the distance.
(From a Photograph.)

VE'SZPRIM (Ger. *Weiszbrunn*), a town in the west of Hungary, beautifully situated among vineyards to the north of Lake Balaton, and 70 miles south-west of Pesth. It is a bishop's see, and contains a handsome episcopal palace, a fine cathedral, a Piarist college, gymnasium, and an institution for decayed or disabled priests. Cloth and flannel weaving, silk-spinning, the cultivation of wine, fruits, and tobacco, are the principal industries; but coal-mining, iron-works, large cattle-markets, and general trade, are carried on. The town has been on several occasions in the possession of the Turks; and an interesting memorial of them is a slender minaret, which rises from an old Gothic tower, and which now serves as a watch-tower against fire. Pop. 11,300.

VETCH (*Vicia*), a genus of plants of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, having a tuft of hairs on the style beneath the stigma, nine stamens united, and one free. To this genus the *Bean* (q. v.) is generally referred. The species, however, are mostly climbing plants, annuals, with pinnate leaves ending in tendrils, and with no terminal leaflet. A number of species are natives of Britain. The common V. (*V. sativa*), sometimes called by agriculturists TARE, frequent in cultivated ground in Britain and throughout Europe, and itself much cultivated as green food for cattle, has rather

large purple, blue, or red flowers in pairs, axillary and almost sessile. In cultivation, it varies considerably both in size and other particulars, as in the breadth of the leaflets, the number of them in a leaf, &c. Oats are generally sown along with it, to afford it a little support, and thus prevent its rotting in wet weather.—*V. Cracca* and *V. sepium* are very common British species, the former with many-flowered stalks, bearing beautiful bluish-purple flowers, a chief ornament of hedges and bushy places in the latter part of summer. These

Vetches.

and other species, natives of Britain or of different parts of Europe and the north of Asia, have been either occasionally cultivated as food for cattle or recommended for cultivation, and generally agree with the Common V. both in their qualities and in the mode of cultivation which they require. *V. biennis* and *V. Narbonnensis* are amongst those chiefly cultivated in some parts of Europe. The species of V. are very numerous, chiefly in the temperate parts of the northern hemisphere.

VETCH, BITTER. See OROBUS.

VETCHLING. See LATHYRUS.

VETERAN CORPS are among the Military Reserves of all nations. They consist of old soldiers past the prime of active manhood, and incapable of taking the field. Their discipline and steadiness, however, admirably fit them for garrisons or fortresses, and for the instruction of young troops. The Veteran Battalions did good service during the French war as home guards, releasing the active troops for foreign service. The British veteran troops consist of about 12,000 Enrolled Pensioners (see PENSIONS). But from the short periods during which men serve as soldiers, and the number of officers who sell out on reaching the rank of captain, it is almost certain that very large veteran corps could be formed from civil life in any case of national emergency.

VETERINARY MEDICINE (Lat. *veterina*, beasts of burden; probably for *vehiterina*, from *veho*, to carry) embraces the medical management of the domestic animals, and appears to have been studied by the ancient Egyptains as well as by the Greeks and Romans. Hippocrates contributed a treatise on equine disorders; Columella and Vegetius (the latter of whom flourished about 300 A. D.) have left several curious veterinary works. Until after the middle of the 18th c., there were, however, no schools for the teaching of veterinary science or art. The several works published in France, Italy, and elsewhere were not of great value. In Great Britain, Blundville and Gervase Markam, who lived in the reign of Elizabeth, published volumes on farriery; Snape, farrier to Charles II., produced an anatomical treatise on the horse; Mr Gibson, previously a surgeon in a cavalry regiment, paid much attention to the disorders of animals, and about the middle of last century, published *The Farrier's Guide*, which continued for many years the best authority on the subject. The treatment of sick horses remained, however, in the hands of the riding-master, the groom, or the shoeing-smith or farrier (from *ferrum*, iron); whilst the doctoring of the other domestic animals devolved upon the goatherd, shepherd, or cowleech.

Veterinary medicine, as a scientific art, takes date from 1761, when the first veterinary college was established at Lyon with royal patronage, under the able teaching of Bourgelât. Five years later, the flourishing school of Alfort, near Paris, was founded. In February 1791, the London College was organised, Charles Vial de St Bel being appointed principal, with Delabere Blaine as assistant-professor. St Bel died in 1793, and was succeeded by Mr Coleman, who, during many years, zealously improved the position and teaching of the college. In Scotland, lectures on veterinary medicine were first given by Mr Dick in 1819. Under the auspices of the Highland and Agricultural Society, and Senatus Academicus, Mr Dick, in 1823, began his systematic teaching of veterinary surgery. Soon afterwards, he erected the college buildings in Clyde Street, Edinburgh, with hospital for sick animals; he collected a valuable museum; extended the curriculum of study; and engaged efficient assistants, among whom were John Barlow and Dr George Wilson, to instruct his pupils in anatomy and physiology, chemistry and materia medica, cattle-practice and histology. At his death in April 1866, Mr Dick bequeathed to the city of Edinburgh the college which he had founded, and his entire fortune, to be devoted to the teaching and improvement of veterinary medicine. For many years, upwards of 80 professional pupils, with a number of agricultural and amateur students, have annually attended the classes at the Edinburgh Veterinary College. About the same numbers are enrolled at the Camden Town College, London. A new school, presided over by Mr John Gamgee, was established in 1865 at Bayswater, London. Since 1861, a veterinary school has been conducted in Glasgow by Mr James Macall. An attendance at one or other of these colleges, during two sessions of five months each, is required before a pupil can present himself to be examined for his degree. The fees for the whole curriculum range at the different educational establishments from £16 to £26, 5*s*. At the Camden Town College, London, a preliminary examination is now very properly required before a pupil can be enrolled, and such an examination must be rendered imperative at all the teaching colleges. As the subjects taught have multiplied and extended, the period of time spent at college must likewise be extended: regular attendance throughout three winter sessions, and one or two shorter summer courses, should be required, before a student becomes eligible for examination. At the best continental schools, three years' study is generally required before a student can obtain his license to practise, and the period is not too long for the acquirement of the scientific and practical knowledge which an educated and competent veterinarian ought to possess. During a longer residence at college, the pupils will have more careful and systematic clinical training in the boxes and hovels of the sick animals; and fuller instruction must likewise be provided in the diseases of cattle, sheep, and pigs.

In 1844, a royal charter was granted, under which veterinary surgeons became a corporate body, with authority to appoint examining boards, and grant diplomas or licenses to practise. According to the Register, 1000 persons now hold these diplomas, which cost £7, 7*s.*, and constitute the holder a member of the Royal College of Veterinary Surgeons. For nearly 40 years, the Highland and Agricultural Society of Scotland have annually appointed an examining board, consisting of medical men and skilled veterinarians; and at the cost of £2, 2*s.*, have granted to pupils who have studied for two sessions at the Edinburgh Veterinary College, a certificate, which has been fully recognised as a guarantee of professional ability by the public throughout her Majesty's dominions, as well as by the authorities at the Horse Guards and at the India Office. The Highland Society's certificate will probably be shortly superseded by the diploma of a College of Veterinary Surgeons for Scotland, empowered by royal charter to grant licenses to practise, and to regulate and extend the teaching at the several Scottish educational establishments. With the annually increasing numbers and value of every description of live-stock throughout our own and other countries, the veterinary profession must continue to rise, and draw towards it men of liberal education. With steadiness and ability, veterinarians frequently realise as much as their medical brethren. In many English towns and districts, there are practices worth from £600 to £1000 a year; whilst in London, Manchester, and elsewhere, the receipts of a few exceed that amount.

The literature of veterinary medicine is still meagre. Mr Percivall and Messrs Gamgee and Law have published text-books on anatomy. The chief reliable authorities on diseases consist of Mr Dick's excellent little manual of veterinary science; Percivall's *Hippopathology*, in 3 vols.; Blaine's *Veterinary Art;* Youatt's volumes on the *Horse, Cattle, Sheep*, and *Pigs;* Mr Gamgee's *Domestic Animals in Health and Disease;* Blaine, Youatt, and Stonehenge on *Dogs;* F. Dun's *Veterinary Medicines, their Actions and Uses; with an Appendix on Diseases of Animals.* The *Veterinarian*, a monthly periodical, has been published for many years, and is now well conducted by the professors of the London College. The *Edinburgh Veterinary Review*, started by Mr Gamgee in 1858, was continued first as a quarterly, and subsequently as a monthly, magazine until 1864.

VETERINARY SURGEON (Army), an officer of a cavalry regiment, or in the artillery, who is charged with the supervision of the horses, and with their cure, if in need of medical aid. A veterinary surgeon is required to produce proper testimonials of qualification, and to pass an examination. By United States regulations one veterinary surgeon at $75 per month is allowed to each of the six old cavalry regiments; but two are attached to each of the four new regiments, one at $100, and one at $175.

VE′TIVER, or CUSCUS, the dried roots of an East Indian grass (*Andropogon muricatus*), which has a very agreeable and persistent odour, something like sandal-wood. It is much prized in India and other parts of the world, and is used to perfume linen, &c. Baskets, fans, and mats are made of it in India; it is remarkable for giving out its perfume for many years, and it is strongest when moistened.

VE′TO, in Politics, the power which one branch of the legislature of a country may have to negative the resolutions of another branch. In the United Kingdom, the power of the crown in the act of legislation is confined to a veto—a right of rejecting, and not resolving. The crown cannot of itself make any alterations in the existing law, but may refuse to sanction alterations suggested and consented to by the two Houses of Parliament. The necessity for such refusal is generally obviated by an observance of the constitutional principle, that the will of the sovereign is that of the responsible ministers of the crown, who only continue in office so long as they have the confidence of parliament. The royal veto is reserved for extreme emergencies; the last instance in which it was exercised was in 1707, when Queen Anne refused her assent to a bill relating to the militia in Scotland. The House of Lords will generally support the prerogative of the crown by rejecting a measure repugnant to the sovereign; and a knowledge of this may enable the ministry to defeat it in the House of Commons—a result which the constitutional influence of the crown and the House of Lords in the Lower House may assist in producing, so as to avoid a collision between the branches of the legislature. In bills of supply, the power of the House of Lords amounts merely to a veto, as does that of the House of Commons in bills affecting the peerage.

In the United States of America, the President has a qualified right to veto all laws passed by Congress; but after that veto has been exercised, the bill which he has rejected may become law by being passed by two-thirds of each House of Congress.

In the French constitution of 1791, it was resolved to have but a single house of legislature, on the principle that it was inconsistent with the idea of a legislature representing the national will that one part of it should have a veto on another, and the same view was adopted by the Convention of 1793. But the arbitrary and violent measures of that latter body induced a strong general conviction that a division of the legislative power, and a veto in some form, was essential to give stability to the government, and moderation to faction; and in the constitution of 1795, a Council of Ancients was introduced, with a power to veto the resolutions of the legislative body.

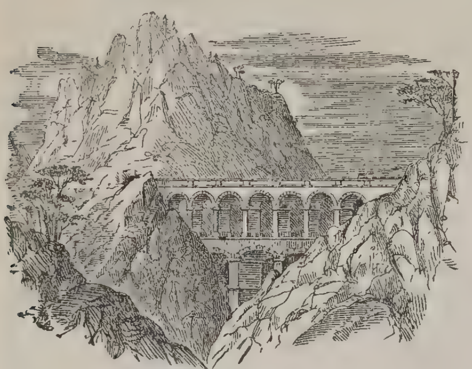
VETO ACT, in Scottish Ecclesiastical Law. See Patronage; Scotland, Church of.

VEUILLOT, Louis, French journalist and author, born in 1813, at Boynes en Gatinais (Loiret). The son of a small cooper, he was sent to a school near Paris, from which he was transferred in 1826 to a lawyer's office. He chose the profession of journalism, and filled several engagements on the provincial press, in the course of which his personalities involved him in various duels. He visited Rome in 1838, previous to which, he states, he was without much faith, either religious or political. He returned to Paris, however, a zealous adherent of the papacy, and, as editor of the *Univers*, soon signalised himself as an aggressive and uncompromising champion of the church. In 1842, he accompanied Marshal Bugeaud to Africa as his secretary, and on his return was made Chief Secretary to the Ministry of the Interior. He again edited the *Univers* in 1848; but his polemical disquisitions brought upon him the censure of the Archbishop of Paris; and in 1853 the clergy of the diocese of Orleans were expressly forbidden by their bishop to read the *Univers*, and the paper, after the usual three warnings, was suppressed by the French government in 1861. It was replaced by the *Monde*, in which V. discussed religious matters in a more temperate spirit. In 1862, he published a pamphlet, under the title of *Parfum de Rome*, which was principally devoted to heaping coals of fire on the head of Cavour, and assailing the Abbé Passaglia with the

bitterest objurgations. As an illustration of V.'s style of dealing with religious adversaries, he prays that 'Heaven may accumulate on the abbé the load of the sins which he has committed, and those which he may have remitted;' that 'his robe may become a robe of fire,' and that Heaven 'may refuse him a single tear to temper its burning.' V., besides polemical pieces, wrote novels, hymns, and a collection of articles entitled *Mélanges Religieux, Historiques, et Littéraires* (1857). He died April 7, 1883.

VEVAY (Ger. *Vivis*), a small town of Switzerland, in the canton of Vaud, remarkable for the beauty of its situation, on the north shore of the Lake of Geneva, 13 miles east of Lausanne. It stands at the mouth of the gorge of the Veveyse, where it opens upon the lake, and where the scenery of the banks is exceedingly beautiful. From the elevations about the town, the fine view to the east commands the gorge of the Rhone, backed by the magnificent rampart of the Alps of Valais. In the church of St Martin (date 1438), Ludlow, one of Charles I.'s judges, and Broughton, who read to him his sentence of death, are buried. The country in the vicinity, especially that between V. and Lausanne, is much occupied by vineyards and orchards, and the wines of the vicinity have some reputation. Pop. about 8000.

VI'ADUCT, a structure for conveying a roadway across a valley or low level, being so called in distinction from an *Aqueduct* (q. v.), which is an erection of the same description for the conveyance of water over a hollow. It is in every respect similar to an extended bridge. The great extension of railways within recent years has rendered the



The Bollerswand Viaduct on the Great Sömmering Railway.

use of viaducts much more common than formerly. These are of every kind of construction—of wood, iron, stone, and brick work (see BRIDGE, TUBULAR BRIDGE, WOODEN BRIDGES, &c.). A railway embankment is also a species of viaduct; but the term is limited to those structures which are more or less open, and rest upon piers. A very peculiar example is that over the Moine, near Nantes in France. The piers are all perforated by a pointed arch, which intersects the main cylindrical arches, and forms a groined roof, similar to that of a Gothic cathedral. This viaduct consists of 15 arches, and is 348 feet in length, and is all built of fine granite.

VIA-MA'LA, a remarkable defile in the canton of Grisons, Switzerland, is a portion of the Hinterrheinthal (see RHINE) which lies between Thusis and Zillis. The sides of the cleft, which is about two miles in length, are immense walls of rock, almost parallel to each other, and so hard that the disintegrating influence of the elements appears not to have produced the slightest effect on them, each projection on one side corresponding to an indentation on the other, almost as perfectly as at the time they were separated. The walls have a maximum height of about 1600 feet, and at various parts of the defile are not more than ten yards apart at the top. Far beneath, the Hither Rhine, compressed till it appears to one above like a mere thread, rushes like an arrow through the gorge. The first part of this defile was long deemed quite inaccessible, and had received the name of the Lost Gulf (Fr. *Trou perdu;* Ger. *Verlorenes Loch*), but in the early part of this century, a magnificent road was constructed along the whole length of the defile, from 400 to 600 feet above the river, by blasting and cutting a 'notch' in the side of the rock. The road is necessarily steep and narrow, crosses from side to side of the defile by three bridges, and is protected now by a canopy of rock overhead, and again by a wooden roofing, from falling stones and trees. So narrow is the crevasse in some places, that fallen trunks and stones are often wedged in between its sides at a considerable distance above the ordinary water-level; and on the occasion of the great flood of 1834, the river, which is generally 400 feet below the second bridge, rose to within a few feet of it, and at the same time carried off the upper bridge.

VIA'NNA, a fortified city and seaport in the north of Portugal, in the province of Minho, stands at the mouth of the Lima, 40 miles north of Oporto. It is handsome and clean, with a tolerable harbour, which admits vessels of 150 tons burden; and it carries on considerable trade with Newfoundland in salt-fish. Pop. about 9000.

VIARE'GGIO, a town of Central Italy, in the province of Lucca, close to the shore of the Mediterranean, 30 miles south-east of Spezia. It is modern, stands in a delightful plain, and has wide straight streets. At the beginning of the present century, it consisted of only a few huts; but its climate, which is healthy and delightful all the year round, and its fine situation, have induced many rich families to settle here, and it is yearly increasing in extent. It is much frequented for bathing in summer. The vicinity is productive in olives, grapes, &c. Population, about 15,000.

VIA'TICUM (Lat. *viaticum*, money allowed for a journey), the word applied in the ancient as well as modern ecclesiastical terminology to the communion administered to dying persons, which, in the case of the great journey to eternity, is thus quaintly likened to the money-provision made for a journey upon earth. This special ministration of the Eucharist to the dying is very ancient (see LORD'S SUPPER); it was the one exceptional case in which, during the times of rigorous canonical penance, the penitents were admitted to the communion before the completion of the appointed cycle of penance. By the modern practice of the Roman Church, it is permitted to the sick, to whom the Eucharist is administered in the form of the viaticum, to receive it, although not having fasted (as is required in all other cases) from the midnight previous. The viaticum may be given frequently during the same sickness, at intervals anciently of ten or seven days, but by the modern practice, even daily, should it be earnestly desired by the sick person. The priest is ordered to bring the sacred elements from the church to the dying person at any hour, whether by day or by night, when he may be called on for this last service of religion.—Protestants reject the very idea of a

viaticum, and regard the administration of the Lord's Supper in that character as superstitious.

VIA'TKA, a government of the east of European Russia, bounded on the east by the governments of Perm and Orenburg, and on the south by that of Kazan. Area, 55,356 sq. m.; pop. (1867) 2,347,796. The surface consists for the most part of marshes and sandy plains, varied here and there by hills. The soil, fertile only in the southern districts, is mostly a mixture of sand and clay. In the south, agriculture is effectively carried on, wheat, rye, barley, and oats being produced in abundance, as well as flax and hemp, which supply materials for the linen manufactures. The principal rivers are the Viatka and Kama (navigable throughout the whole year), and their affluents. Owing to the number of navigable streams, and to the well-regulated land-communications, the traffic of the government is successfully carried on. Horses of a fine breed are reared, but the principal source of the wealth of V. is its timber. Iron-works, distilleries, tanneries, and glass and cotton factories, are in operation.

VIATKA, a town of Russia, capital of the government of the same name, on the river Viatka, 280 miles north-east of Nijni-Novgorod. It was founded by the inhabitants of Novgorod, and was annexed to the Muscovite dukedom in 1489. The chief branches of industry are the preparation of skins and the manufacture of tallow and wax-candles. Corn is exported annually to the amount of 300,000 roubles (£46,875). Pop. 19,624.

VIA'ZMA, a town of Great Russia, in the government of Smolensk, and 100 miles east-north-east of the town of that name, on the Viazma. It is first mentioned in 1239, and, after being owned successively by the Lithuanians and Poles, it finally became Russian in 1634. In 1812, after a bloody battle between the Russian and French armies, in which the former was victorious, V. was demolished, and there are now hardly any remains of the old town. It carries on an active trade in corn, flax, hemp-seed, tallow, &c., and is the entrepôt for goods exported to St Petersburg and Riga. V. gingerbread is exported to all parts of the empire. Pop. 10,853.

VIBI'CES. This term is applied, in Medicine, to patches on the skin, varying in tint from bright red to violet, which occur in certain diseased conditions of the blood, and especially in purpura. They are caused by minute hæmorrhages of the capillaries of the true skin. The word is a Latin one, being the nominative plural of *vibex, -icis*, the mark of a stripe.

VI'BORG, the oldest city in North Jutland, and one of the oldest in Denmark, on a small lake, 25 miles west of Randers. Its cathedral, originally founded in the 12th c., was rebuilt in 1726. V., at which all the great highways of the interior converge, is important as a military post. Pop. 4579, engaged in the manufacture of woollen fabrics, leather, and tobacco.

VIBRIO'NIDÆ, a family of Infusoria, having an elongated or worm-like form, of which the Ear-cockle (q. v.) is an example. They derive their name from their darting and quivering motion. Some of them, as the ear-cockle, are found in living plants, others in corrupting organic matter, as the *eels* of paste and vinegar.

VIBU'RNUM, a genus of plants of the natural order *Caprifoliaceæ*, having a 5-toothed calyx, a 5-lobed, wheel-shaped, bell-shaped, or tubular corolla, 5 stamens, 3 sessile stigmas, and a one-seeded berry. The species are shrubs with simple leaves, natives chiefly of the northern parts of the world. *V. opulus* is the Guelder Rose (q. v.), or Snowball Tree, and *V. Laurustinus* is the Laurustinus (q. v.), both well-known ornamental shrubs. *V. Lantana*, sometimes called the WAYFARING TREE, is a native of the warmer temperate parts of Europe and Asia, not unfrequent in England, and often planted as an ornamental shrub. It is a large shrub or low tree, with large elliptic serrated leaves, downy, with star-like hairs on the under side. The young shoots are very downy. The flowers are small and white, in large dense cymes; the berries purplish black, mealy, and mucilaginous, with a peculiar sweetish taste, disagreeable to many, but relished by some. They are useful in diarrhœa and catarrh. Bird-lime is made from the roots in the south of Europe. The inner bark is very acrid, and was formerly used as a vesicant. The wood is white and hard, and is prized by turners. Tubes for tobacco-pipes are made of the young shoots.—A North American species, *V. opulus*, or *Cranberry tree*, nearly allied to the Guelder Rose, produced berries of an agreeable acid taste, which are used like cranberries.

VICAR (Lat. *vicarius*, from *vicem*, i. e., *gerens*, acting in the place of another), the title given to the substitute, whether temporary or permanent, employed to act in the place of certain ecclesiastical officials, whether individuals or corporations; as of the pope, a bishop, a chapter, a parish priest, &c. Vicars take different names from these various considerations. Vicars of the pope are called 'vicars-apostolic,' and they are generally invested with episcopal authority, in some place where there is no canonical bishop. Vicars of a bishop are either 'vicars-general,' who have the full authority of the bishop all over his diocese, or 'vicars-forane' (Lat. *foraneus*, from *foris*, abroad), whose authority is confined to a particular district, and generally otherwise limited. A vicar-capitular is the person elected by the chapter of a diocese, during the vacancy of the see, to hold the place of the bishop, and to exercise all the authority necessary for the government of the diocese. The vicar-capitular, however, is not competent to do any act of episcopal order, as ordination, confirmation, &c. His power is restricted in other ways which it would be out of place to detail here. Parochial vicars are either perpetual, as in parishes, which were anciently held *in Commendam* (q. v.), or which were held by religious corporations; or temporary, whose appointment may be recalled at pleasure, or after a fixed time. The name, in this sense, is sometimes given, especially in the Roman Catholic Church, to the assistant-priest, or, as he is called in England, the curate, in a parish. The functions of 'vicars-apostolic' are described under the head IN PARTIBUS INFIDELIUM.

VICE-A'DMIRAL. See ADMIRAL and FLAG-OFFICER.

VICE-CHA'MBERLAIN. See CHAMBERLAIN, LORD.

VICE-CHA'NCELLOR, a judge in equity, appointed by the crown under letters-patent, to assist the Lord Chancellor of England. The title and functions are at least as old as the reign of Henry II.; but the office long fell into disuse, and was revived by statute 53 Geo. III. c. 24, appointing one vice-chancellor. Act 5 Vict. c. 5, s. 19, afterwards appointed two more, on the abolition of the equitable jurisdiction of the Court of Exchequer. The office is ancillary to that of the Lord Chancellor for whom the vice-chancellor is empowered to act in his absence, besides being entitled to hold separate courts. The vice-chancellor and the Master of the Rolls have co-ordinate jurisdiction, in the first

instance, over all matters of equity, subject to the revision of the court of appeal. The vice-chancellors hold their office *ad vitam aut culpam*, and are not expected, like the Lord Chancellor, to resign office with the ministry.

The vice-chancellor of a university is an officer who is empowered to discharge certain duties of the chancellor, chiefly those connected with granting degrees, in his absence.

VICE-CON'SUL, a subordinate officer, to whom consular functions are delegated in some particular part of a district already under the supervision of a consul. A British vice-consul is selected by the consul under whom he is to act, and his name is transmitted for approval to the Secretary of State for Foreign Affairs. If he is approved of, the consul is directed to furnish him with authority to act, and to impart to him instructions similar to what he himself has received from the Foreign Secretary. The vice-consul acts under the general supervision of the consul, corresponding with him in ordinary cases, but in some special cases with the Foreign Office. A consul is not at liberty to dismiss a vice-consul acting within his district without the sanction of the Foreign Secretary; but if of opinion that sufficient grounds for the dismissal exist, his duty is to give information to the Foreign Secretary, suspending the vice-consul in the meantime, if the circumstances be urgent; and in all cases awaiting the decision of the Foreign Secretary, before taking ulterior steps. See CONSUL.

VICE'NNIAL PRESCRIPTION, in the Law of Scotland, is the limitation which is put to certain actions after the lapse of 20 years, such as actions by heirs to reduce an erroneous retour.

VICE'NZA, a handsome city of Italy, beautifully situated at the confluence of the rivers Bacchiglione and Retrone, 42 miles west of Venice by railway. The rivers are crossed by eight bridges, one of which, a bold single arch, is attributed to Palladio, who was a native of the city, and to whose genius it is much indebted for its beauty. V. is surrounded by a moat, and walls half in ruins, and contains many fine palaces and churches. The Piazza dei Signori, a remarkably fine square, contains a lofty and slender campanile, 270 feet high, and only 23 feet wide. The Palazzo della Ragione is a handsome Gothic building, by Palladio. The Palazzo Prefettizio, by the same architect, is a rich and fanciful Corinthian edifice. The Duomo, built in 1467, is Gothic; the nave of it is 60 feet wide; and in certain of the chapels are interesting pictures. The Teatro Olimpico, the scenery of which is fixed, and represents a species of piazza, with diverging streets of real elevation, but diminishing in size, is by Palladio. V. contains a lyceum, a seminary, and many colleges; a library, numbering 60,000 vols., and a hospital, and many benevolent institutions. Manufactures of silk, linen, earthenware, paper, and velvet are carried on. The surrounding country, studded with mansion-houses, and rich in vineyards, is exceedingly beautiful. Pop. 25,000.

V. (anc. *Vicentia*, or, more correctly, perhaps, according to inscriptions, *Vicetia*) is a very ancient city. An inscription records its existence in 136 B. C.; and it continued to be a municipal town of some consideration, till it was laid waste by Attila, 452 A. D. It revived again under the Lombards, and became for a time, in the middle ages, an independent republic.

VI'CEROY (Lat. *vice*, in place of, and Fr. *roi*, king), a title popularly given to any officer who is delegated by a sovereign to exercise regal authority in his name in a dependency, as the Lord-lieutenant of Ireland—who, however, is never officially so styled. It was the proper official designation of the governors of Naples, Spain, and Peru, under the old Spanish monarchy.

VICH, or VIQUE, a city of Spain in Catalonia, modern province of Gerona, on a hill-girt plain about 45 miles north of Barcelona. Its cathedral, built about 1040, but repaired and modernised about the end of the 18th c., is bold and elegant in the interior, and the Gothic cloisters are of the most rich and elegant description. Corn, fruit, and a bad wine are the products of the vicinity; and the inhabitants are employed in weaving, and in the manufacture of hats and paper. Pop. 12,000. V., the Roman *Ausa*, was afterwards called *Ausona* and *Vicus Ausonensis*, of the first part of which its present name is a corruption.

VICHY, a small town of the interior of France, in the dep. of Allier, stands on the Allier, in a fine valley, surrounded by hills clad with vines and fruit-trees, 35 miles south-south-east of Moulins. Pop. 5424. V. is the most fashionable bathing resort in France. The springs which rise at the foot of the volcanic mountains of Auvergne (q. v.) are of the alkaline class, and the most efficacious of the kind that are known. They vary in temperature from 68° to 112° Fah., and are used both for drinking and bathing. They are resorted to in cases of indigestion, chronic catarrh, gout, &c. See MINERAL WATERS.

The virtues of the *aquæ calidæ* of this place were known in Roman times, as is testified by the numerous remains of marble baths and coins of the times of Claudius and Nero that have been dug up; but their modern repute arose only in the present century.

VI'CIA. See VETCH and BEAN.

VI'CKSBURG, a city and port of Mississippi, U. S., on the Mississippi River, 408 miles north of New Orleans, 44½ west of Jackson, built on a collection of high bluffs. It is the chief town between Memphis and New Orleans, exporting before the war of 1861, 100,000 bales of cotton per annum. It was strongly fortified in 1861, and provided with a large garrison. In January 1862, it was attacked by the U. S. naval forces from Memphis and New Orleans, but without success. In April 1863, a naval attack was combined with the land-forces under General Grant, who defeated General Pemberton near Jackson, cut off supplies and reinforcements from the garrison, and with a close siege and continual assaults, compelled a surrender, July 4, 1863, with 30,000 prisoners of war, 200 cannon, and 70,000 stand of arms. Pop. (1880) 11,814.

VICO, GIAMBATTISTA (or GIOVANNI BATTISTA), a jurist, philosopher, and critic, was born at Naples in 1668, spent the whole of his life in that city, and died there in 1744. He was the son of a small bookseller. He was educated by the Jesuits, and afterwards studied for the bar. Weak health preventing him from following his profession, he became tutor in jurisprudence to a nephew of the Bishop of Ischia; and after filling this position for nine years, he obtained the chair of Rhetoric in the university of Naples. This office was poorly paid; but though much distinguished by persons of the highest position, V. did not succeed in getting a better one until the accession of the Bourbons in 1735, when he was appointed historiographer to the king of Naples. As he married early, and had a large family, his life was passed in great poverty, and it was, moreover, embittered by family troubles, and by constant ill-health. The great work which has made his name illustrious, the *Scienza Nuova*, first appeared in 1725; but it was completely recast in a subsequent edition, published in 1730, with the effect of making

it more imposing as a system, at the expense of a great loss of clearness. A third edition, in which the work was considerably enlarged, was published in 1745, shortly after the author's death. In the *Scienza Nuova*, V. brought together, and attempted to fuse into a system, opinions which he had previously advanced in a somewhat numerous series of separate treatises. The work was long in arriving at its proper place in European literature, which must be in a great measure attributed to its obscure and enigmatical style. Much of the obscurity arises from the use of an uncouth terminology, which the author often leaves unexplained, and (in the case of the later and authoritative editions) from the rigorous application of the deductive method to subjects which do not always admit of it. The *Scienza Nuova* was virtually unknown out of Italy in 1822, when a German translation of it appeared at Leipzig. It was, a few years later, translated into French (with some curtailment) by M. Michelet (*Principes de la Philosophie de l'Histoire, traduits de la 'Scienza Nuova' de G. B. Vico;* Paris, 1827); and the author has since that found his proper rank among the most profound, original, and ingenious of modern thinkers.

The *Scienza Nuova* (*De' Principj d'una Scienza Nuova d'interno alla Comune Natura della Nazioni*) may be described as a *Novum Organum* of politico-historical knowledge. Observing, amid the infinite variety of thoughts and actions, of language and manners which the history of nations presents, a constant recurrence of the same characteristics, in the political changes which peoples the furthest removed from each other in time and place have passed through, an essential similarity of development, V. proposed to himself the task of distinguishing amid social phenomena the regular from the accidental; of finding out the laws which govern the formation, the growth, and the decay of all societies; in fine, of tracing the outlines of the universal, the ideal history of society—the idea of which he himself believed to have existed from eternity in the mind of God. In doing this, he attempted, by means of historical criticism on the widest basis to illustrate the inter-dependence of all the sciences; to shew that the progress of each of them is related to that of all the others, and the progress of all of them dependent upon, while also acting powerfully upon the general condition of society. And while holding that the actual state of every society is the result of a free development of the human faculties, he attempted to give a historical demonstration of the existence of a Divine Providence directing the career of nations, overruling the designs which men propose to themselves; operating, however, not by positive laws, or arbitrary interferences, but by means of methods and expedients which men resort to freely. It has been not inaptly said that the *Scienza Nuova* includes a system of social (as distinguished from natural) theology—a demonstration of God's government of the world, and of the laws in which that government consists. V., in these inquiries, accepted from Descartes the individual consciousness as one of the criteria of truth; but he also employed another—the collective consciousness, or the common sense of mankind—the accord of the race, as it may be gathered from history—in a word, authority.

It would be difficult to overrate the ingenuity and originality of many of the inquiries into which V. was led by the attempt to delineate the ideal history of society; and he has rarely failed to put forward views rational and probable compared with those which were accepted among his contemporaries. With a truly admirable insight, he has not seldom hit upon the conclusions to which increased social knowledge and more scientific conceptions have conducted inquirers of later generations. Thus, in clearing the ground for the foundation of his system, he was led to precisely those views about Homer and the authorship of the Homeric poems which are popularly associated with the name of Wolf; and to anticipate the general view of the credibility of early Roman history which was elaborated by Niebuhr. (See also COMTE, the germs of many of whose speculations may be found in Vico.) The beginnings of religion, the origin of poetry and language, the commencement of society (which he ascribes to the influence of a common religious belief and worship), the foundation of the privileges of the heroic or aristocratic class, are among the earlier subjects of his speculation. He proceeds to trace the origin of jurisprudence, and to shew how its development has been dependent upon social changes; and he afterwards deduces from the history of ancient societies, and in some degree from the history of the governments which sprung out of the ruins of the Roman Empire, the laws which govern the progress, the conservation, and the decay of nations. A monarchy, with an equality of civil and political rights as between subjects, was his ideal of good government for advanced societies.

Though he ascribed to religion a paramount influence in forming and in conserving society, and though it was one of his principal objects to demonstrate the divine government of the world, V. did not escape the suspicion of having written in a spirit of hostility to religion. It was alleged that he had written so obscurely, as he often did, through the fear of incurring ecclesiastical censures. Some critics of another school charged him, with at least equal plausibility, of having striven, both in his particular doctrines and in his consecration of the principle of authority, to satisfy the Roman Catholic Church. The cavils made on either side, however, do not seem deserving of much attention; and it is pleasant to know that V., though not unconcerned about the accusations made against him, felt in his later years consoled for the many trials and disappointments of his life, by the completion of a work, the greatness of which he knew better than any of his contemporaries. In 1818, the Marquis de Villa Rosa published a collection of the whole of V.'s works. A second edition appeared in 1835.

VICTOR, CLAUDE PERRIN, Duke of Belluno, and Marshal of France, was born, 7th December 1764, at La Marche, in the dep. of Vosges, and at the age of 17 enlisted as drummer in a regiment of artillery. He received his discharge after eight years of service as a common soldier; but re-enlisted in 1792, and having fortunately attracted the attention of Napoleon by his able conduct at the siege of Toulon in 1793, was promoted, through his influence, at the close of that year. In the Italian campaigns of 1796—1797, and 1799—1800, he commanded the vanguard, and aided by the favour of Napoleon, who threw opportunities in his way, displayed great skill and extreme daring on numerous occasions. At Marengo he maintained such an obstinate resistance for eight hours to the overwhelming numbers of the enemy, that the expected reinforcements had time to arrive, and convert the imminent victory of the Austrians into a crushing defeat. In 1806, he commanded with distinction a *corps d'armée* in the Prussian and Russian campaigns, and though captured in 1807 by Schill's partisans, he was exchanged (for Blücher) in time to win, on the bloody field of Friedland, the baton of Marshal of France, and the title of Duke of Belluno. As governor of Berlin, he gained the esteem of the

Prussians by his dignity and moderation; and in 1808, he was sent to command the first corps d'armée in Spain. Here he gained several victories, notably over Blake at Espinosa, and Cuesta at Medellin; but was defeated by Wellington in the obstinate battle of Talavera (q. v.), and again by Sir Thomas Graham at Barrosa (q. v.). After a fruitless blockade of Cadiz, he was recalled to command the ninth corps d'armée in the Russian campaign of 1812; and though occasionally defeated in his many contests with the Russians, his general conduct and success were worthy of his previous high reputation. When the allies, in overwhelming numbers, were closing round France, V. appeared prominently in the fore-front of the defence, made a valiant stand at the passes of the Vosges, and retook Saint Dizier and Brienne at the point of the bayonet; but his neglecting to occupy the bridge of Montereau was a fault which Napoleon could not pass over, and he was deposed in favour of Gérard (q. v.). Notwithstanding this disgrace, he persisted in continuing with the army, and his zeal for his country suffered no diminution, as his energetic conduct at subsequent minor combats, and at the battle of Craonne, sufficiently proved. A severe wound which he received at this last battle brought his military career to a close; and had it chanced to be mortal, the character of V. would have stood out in bold relief on the page of history as an able soldier, a faithful friend and follower, and a sterling patriot. But though not mortal, in a physical sense, it brought death to his hitherto spotless reputation; for the sickening ardour of his professions of loyalty to the Bourbons, and his vile calumniations of the now fallen chief, to whom he wholly owed his rise, displayed the foulest ingratitude. V.'s servile attachment to Louis XVIII., however, gained him a peerage and other honours; but the readiness with which he accepted the presidency of the military commission appointed to try such of his old companions in arms as had deserted to Napoleon during the 'Hundred Days,' brought upon him merited obloquy. His subsequent career requires but brief notice: he was minister of war in 1821—1823; second in command in the Peninsula in 1823; and was afterwards accredited as ambassador to the court of Vienna. The Austrian court refused to receive him unless he laid aside his ducal title; and this question of etiquette attracted so much attention, and gave rise to so much vehement discussion, that the good understanding of the two countries was for a time endangered. After this event, V. took no part in public affairs, and died at Paris, March 1, 1841.

VICTOR-AMADEUS, the name of three sovereigns of the House of Savoy.—VICTOR-AMADEUS I., Duke of Savoy, succeeded his father, Charles-Emmanuel the Great, in 1630, and carried on the war with France; but in 1631, he was forced to surrender Pignerol, La Perouse, Angrone, and Luzerne to France, in exchange for Montferrat and Alba. He paid great attention to the internal improvement of his dominions, and re-established the university of Turin on an extended scale; but the irresistible pressure exercised on him by Richelieu, forced him into a war with the Spaniards in Italy; and after routing his opponents at Tornavento (1636) and Montebaldone (1637), he died at Vercelli, October 7, 1637.—VICTOR-AMADEUS II., grandson of the preceding, and one of the most able of princes, was born May 14, 1666, and succeeded his father, Charles-Emmanuel II., in June 1675. Till 1680, the administration of government was in the hands of his mother, Marie Françoise of Nemours, who, in spite of the pressure of France on one side and Austria on the other, succeeded in preserving a neutral attitude in the quarrels between her two powerful neighbours. In 1684, V. married Anne-Marie of Orleans, the niece of Louis XIV.; but the overbearing insolence of the 'Grand Monarque,' who forced him to persecute the Waldenses (q. v.), and arrogantly ordered him to contribute an auxiliary force to the French army, and give up the citadel of Turin, roused the ire of the high-spirited young duke, speedily put an end to the good understanding which would naturally have accompanied their intimate relationship, and drove him into a league with Austria and Spain against France. In revenge, a French army under Catinat assailed V.'s dominions, and though he was reinforced by 4000 Austrians under his relative, Prince Eugene, the allies were completely routed at Staffarda (August 1690), and the victorious Catinat had completed the reduction of Savoy and Nice before the winter of 1691. The duke, aided by considerable reinforcements from Austria and Spain, gallantly maintained the contest; but a second and much more disastrous defeat at Marsaglia (October 4, 1693), where he left 10,000 dead on the field, put almost the whole of Piedmont at the mercy of the French. The war, however, continued; the duke's obstinacy and almost romantic daring balancing Catinat's high military genius; till in the autumn of 1696, a treaty much more favourable to Savoy than to France, detached the former from the grand alliance. When the quarrel respecting the Spanish Succession (q. v.) broke out, V. took part with France—an alliance cemented by the marriage of his second daughter, Louisa Gabriele, to Philip of Anjou, the new monarch of Spain, as well as by the previous (1697) marriage of his eldest daughter (the mother of Louis XV.) to Louis, Duke of Burgundy, Louis XIV.'s grandson—and was appointed commander-in-chief of the combined armies of France and Spain; but though he was aided by the counsels of his old opponent Catinat, the Austrians, under his former ally, Prince Eugene, defeated him at Chiari (November 1701), and drove him behind the Oglio. Two years afterwards, the successes of Vendome in Italy and Villars in Germany, by bringing more prominently before his imagination the possibility of having the Bourbons for his neighbours on the east as well as on the west, along with the tempting offers of Austria and Britain, induced him to abandon France, and join the alliance against her. In revenge for what they called the duke's treachery, the French under Vendome overran and devastated Piedmont; but with the recall of their chief, fortune deserted the French, and they were totally routed by the duke and Prince Eugene under the walls of Turin, 7th September 1706. The duke, who had some years before retired from this contest, was rewarded by the treaty of Utrecht (1713) with the rest of Montferrat, Val-Sesia, Lomellino, and the island of Sicily, with the title of king; besides being acknowledged as heir to the Spanish throne, in case of the failure of the Bourbon dynasty. In 1720, he was made to surrender Sicily to the emperor in exchange for Sardinia. The latter portion of V.'s long reign was wholly free from foreign strife; and his restless energy was employed in improving the system of administration, thoroughly assimilating the new continental acquisitions, in replenishing the treasury, which, in spite of the British subsidy, had been drained by the long contest with France, and in encouraging agriculture and industry, especially the cultivation of mulberry trees and tending of silk-worms. Reforms and improvements were effected in the university of Turin, and several colleges founded. On September 2, 1730, the king abdicated; but attempting, in the following year, to resume the regal dignity and functions, he was arrested and

imprisoned. He died at the château of Moncalieri, near Turin, 31st October 1732.—VICTOR-AMADEUS III., grandson of the preceding, succeeded his father Charles-Emmanuel III. in 1773. His reign was full of misfortune and disaster, and was brought to a close by his death in 1796, after the compulsory cession of Savoy and Nice to the French Republic.

VICTOR-EMMANUEL I. (Ital. *Vittore-Emmanuele*), king of Sardinia, the second son of Victor-Amadeus III., was born 24th July 1759, and till his accession, bore the title of Duke of Aosta. He was one of the most determined adversaries of the French Revolution; and on the outbreak of war in 1792, he was chosen to command the Sardinian army, repulsed the French at Gillette, and forced his way to the mouth of the Var, but was ultimately compelled to seek shelter among the Alps. He opposed himself strongly to the conclusion of peace with France in 1796; and from this time lived in Southern Italy, and afterwards at Cagliari, whence he did not return to Turin till 1814. He had assumed the royal title on his elder brother's abdication in 1802; and the treaty of Paris restored to him Piedmont, Nice, and the half of Savoy in 1814; the treaty of 1815 added the remainder of Savoy, while the Congress of Vienna presented him with the duchy of Genoa—so that the little kingdom had profited territorially by its troubles. But the loyal delight of the Savoyards and Piedmontese at the return of their legitimate ruler was speedily quenched by the first acts of his administration. The French institutions to which they had been long enough accustomed to feel their immense superiority over the system they had supplanted, were abolished, and the old absolutism gradually restored. This change, which was no doubt to a certain extent effected by way of destroying all trace of French domination, by depriving the people of various important privileges and amenities, restoring old and hated abuses, and increasing taxation, excited wide discontent, which was heightened by the odious religious persecutions of the Vaudois and the Jews; secret societies were formed, and on March 10, 1821, a revolution broke out. The army proclaimed the constitution promulgated by the Spanish Cortes in 1812; and the king, rather than take the oath to it, resigned in favour of his brother, Charles Felix, March 23, 1821. He died at Moncalieri, near Turin, January 10, 1824.

VICTOR-EMMANUEL II., late king of Italy, the son of Charles-Albert (q. v.), king of Sardinia, was born March 14, 1820. He was a pupil of the Jesuits; but nevertheless, under his father's superintendence, received an excellent education; and, being heir to the throne, he commanded, in accordance with an old custom of his House, the brigade of Savoy in the campaign of 1848—1849, and displayed great gallantry at Goito and Novara. On the evening of the latter battle, his father, seeing the hopelessness of the struggle, and unwilling to bow to the onerous conditions offered by Radetsky, abdicated in favour of V., who, being the husband of the Archduchess Adelaide (the cousin of the Austrian emperor), and uncommitted to the views of the Italian Ultra-democrats, might hope to obtain more favourable terms from the victor. V. thus ascended the throne of Sardinia, 23d March 1849, and restrained effectually, for a time, the enthusiasm of the more ardent among the national party, though, on the other hand, he maintained, with the utmost fidelity, the provisions of the liberal constitution granted by his father. He made a happy choice of ministers in such men as Cavour, D'Azeglio, &c., whose policy it was to increase the strength and importance of the country by improved administration, rigid economy in the finances, care of the army, and encouragement to trade by the conclusion of commercial treaties with foreign nations. They saw too clearly that, despite the intense and almost unanimous desire for unity throughout Italy, a contest single-handed with Austria was utterly hopeless, and preferred, till a more convenient season, to seem to renounce all idea of any such project. The property of the state was sold, and various measures calculated to greatly diminish the privileges, and restrict within moderate limits the inordinate influence of the clergy, adopted—changes which brought upon the king the thunders of the Vatican; but V., nothing daunted, protested by a vigorous 'memorandum,' and more obstinately asserted and maintained his independence of the papacy. The revolt at Genoa was sternly suppressed; but the king and his ministers were, in secret, by no means displeased to see that the feeling of nationality was still vigorous; for, following the traditional policy of the House of Savoy, he was only biding his time to 'descend with the valley of the Po,' and swallow 'another leaf of the artichoke.' With the view of improving his position in Europe, and gaining a place at its council-board, he sent an army of 17,000 men, under La Marmora, to take part in the Crimean war on the side of Turkey; and visited (1855) in person the courts of Paris and London, being received by French and English with great enthusiasm. After the peace of Paris (1856), he entered into a closer alliance with France, gave his elder daughter Clotilde in marriage (30th January 1859) to Prince Napoleon, and backed by the French arms, provoked a war with Austria. The campaign was brief but decisive—the Austrians were routed in every battle, and the Italians were hailing with exultation the near approach to fulfilment of their long-cherished dreams of unity, when the suddenly concluded peace between France and Austria at Villa-Franca dashed their hopes to the ground. The Milanese (minus the fortresses of Mantua and Peschiera) only was added to the Sardinian monarchy, and for this the king ceded Nice and Savoy (the cradle of his race) to France as the price of its alliance. But the people of Central Italy refused indignantly the offer of Prince Napoleon as their sovereign; and Tuscany, Modena, Parma, and the Romagna, renouncing their allegiance to their respective sovereigns, voted for annexation to Sardinia, and were formally adopted by V. as his subjects. This was a greater advance towards the unification of Italy than the French emperor wished, and accordingly, V., who was still dependent on his ally for safety, though secretly favourable to the project of the 'Italian Liberator,' disavowed all knowledge of Garibaldi's expedition to Sicily, forbade him, after the island was conquered, to pass over to the continent; though he subsequently, with the consent of Napoleon III., who was desirous of preserving Rome to the pope, sent an army to aid him in conquering Naples, and formally accepted the sovereignty of the Two Sicilies. But in 1862, Garibaldi, thinking that the conquest of Rome in the same way would be equally acceptable to his sovereign, returned to Sicily, raised an army of volunteers, and was rapidly advancing on the ancient capital, when V., forced by France, put an end to the expedition by capturing Garibaldi and his army at Aspromonte. Though proclaimed by the Senate and House of Deputies *King of Italy* in February 1861, V. prudently postponed all attempts to annex Rome and Venice; and directed his attention to the internal affairs of his kingdom, which was much distracted by the intrigues of the sovereigns whom he had supplanted

At length, in the quarrel between Prussia and Austria for supremacy in Germany, appeared his opportunity; and an offensive and defensive alliance with the former of these powers was followed by the invasion of Venetia, which was ultimately surrendered by Austria. The evacuation of Rome within two years by the French was stipulated by a convention between France and Italy, and the small remnant of the 'patrimony of St. Peter' (see PAPAL STATES) which remained to the Pope was taken possession of by an Italian army after the withdrawal of the French garrison, and annexed to the dominion of Victor Emmanuel, Oct. 9, 1870. On Dec. 31, 1870, he entered Rome in triumph, and thenceforth ruled over united Italy with honour to himself and satisfaction to his subjects until his death, which occurred Jan. 9, 1878. He was succeeded by his son, Prince Humbert.

VICTORIA I., Queen of the United Kingdom of Great Britain and Ireland, daughter and only child of Edward, Duke of Kent, 4th son of George III., was born at Kensington Palace, May 24, 1819. Her mother, Victoria Mary Louisa, was 4th daughter of Francis, reigning Duke of Saxe-Coburg-Saalfeld, and sister of Leopold, king of the Belgians. Her first husband, the Prince of Leiningen, died in 1814; and on the 11th July 1818, she married, at Kew, the Duke of Kent. The duke died January 23, 1820, leaving his widow in charge of an infant daughter only eight months old, who had been baptised with the names of Alexandrina Victoria. The Duchess of Kent fulfilled the important duties which devolved upon her with more than maternal solicitude, and with admirable care and prudence. The infant princess, as she grew up, was taught to seek health by exercise and temperance, to acquire fearlessness even from her amusements, such as riding and sailing, and to practise a wise economy united to a discriminating charity. After a few years, the Duchess of Northumberland was associated with her mother in her nurture and education. The Princess V. became accomplished in music, drawing, and the continental languages; and acquired a knowledge of some of the sciences, particularly botany. Her father having belonged to the Whigs, her political education was naturally derived from the members of that party; and to Viscount Melbourne (q. v.) belongs the credit of having thoroughly instructed her in the principles of the British constitution. She ascended the throne of the United Kingdom on the demise of her uncle, William IV. (q. v.), June 20, 1837; her uncle, the Duke of Cumberland, becoming king of Hanover, in virtue of the law which excludes females from that throne. By this event, the connection which had lasted for 123 years between the crowns of England and Hanover was terminated. Victoria was proclaimed June 21, 1837, and crowned at Westminster, June 28, 1838. She found on her accession Viscount Melbourne at the head of the government; and during his premiership, and with the cordial assent of her subjects, the young queen was married at St James's Palace (February 10, 1840) to Prince Albert (q. v.), Prince of Saxe-Coburg and Gotha, and second son of the then reigning duke. Her Majesty has had issue — four sons and five daughters: the Princess Royal, Victoria, born November 21, 1840, who was married, January 25, 1858, to Frederick William, now Crown Prince of Prussia, and heir-apparent to the throne of Prussia and Germany; Albert Edward, Prince of Wales, heir-apparent to the throne of the United Kingdom, born November 9, 1841, married, March 10, 1863, Princess Alexandra of Denmark, eldest daughter of Christian IX., king of Denmark; Princess Alice, born April 25, 1843, married, July 1, 1862, Prince Frederick William Louis of Hesse; Prince Alfred, born August 6, 1844, created Duke of Edinburgh 1866; Princess Helena, born May 25, 1846, married, July 5, 1866, to Prince Christian of Slesvig-Holstein-Sonderburg-Augustenburg; Princess Louisa, born March 18, 1848, married, March 21, 1871, to the Marquis of Lorne; Prince Arthur, born May 1, 1850; Prince Leopold, born April 7, 1853; Princess Beatrice, born April 14, 1857.

It will suffice here to refer to a few of the more memorable events of this eventful reign. The changes of administration may be traced in the articles GREAT BRITAIN, MELBOURNE, PEEL, RUSSELL, DERBY, ABERDEEN, PALMERSTON, GLADSTONE, DISRAELI. The legislative measures of greatest importance were the establishment (1840) of the penny-postage (see POST-OFFICE); the Amendment of the Poor Laws (q. v.) in Scotland (1845) and Ireland (1847); the Abolition (1846) of the Corn Laws (q. v.), and (1849) of the Navigation Laws (q. v.); the Irish Encumbered Estates Act (see TITLE, &c.); the transfer (1858) of the Indian possessions from the East India Company to the crown (see INDIA); the admission (1858) of Jews into the House of Commons; the Reform Act of 1867; the Disestablishment of the Irish Church (1869); the Irish Land Act (1870); the Abolition of Purchase in the Army (1871); the Elementary Education Act for England (1870), and the Scotch Education Act (1872). Other events which will signalise this period of British history were the formation of the Free Church (q. v.) of Scotland (1843); the discovery of the North-west Passage (q. v.) by Sir Robert M'Clure (1850); the Exhibitions (q. v.) of 1851 and 1862; the discovery of gold in Australia (q. v.) and in British Columbia; the war (1854—1856) with Russia (q. v.) in defence of Turkey (q. v.), in which the siege of Sebastopol and the sufferings of the British army form the most prominent episodes; the Indian Mutiny, in 1857 (see INDIA); the Volunteer (q. v.) movement (1859), and the establishment (1866) of telegraphic communication with America (see TELEGRAPH); the Abyssinian war, 1867 (see THEODORE, in SUPPLEMENT); the formation of the Dominion of Canada, 1867 (see CANADA), and the Ashantee war, 1873—1874. The same period has witnessed the most signal commotions and changes among surrounding nations; 1848 was a year of European revolutions, during which the throne of Queen Victoria remained unshaken, the only disturbance being an abortive Chartist demonstration (see CHARTISM). The constitutional monarchy of France (q. v.) fell, and was succeeded by a republic, which soon gave place (1852) to the second Empire under Louis Napoleon (q. v.), and which fell in 1870. The great civil war in the United States of America (q. v.) has resulted in the extinction of slavery; the formation of the kingdom of Italy (q. v.) has been completed by the acquisition of Rome (see VENICE and ROME); the brief war of 1866 between Prussia and Austria has led to the unification of Germany, and the formation of a northern confederation, under the leadership of Prussia; and the Prusso-Gallic war in 1870—1871 has been followed by the re-establishment of a German empire.

The all but universal loyalty and devotion of her subjects have not prevented attempts on her life. In 1842, John Francis fired a pistol at her Majesty, who happily escaped unhurt; he was sentenced to death, but her Majesty commuted his punishment to transportation for life. In the same year, one Bean presented a pistol at the Queen, but a bystander struck down his arm. Bean was sentenced to 18 months' imprisonment, and an act was passed inflicting the punishment of whipping for such attempts. In 1852, Lieutenant Pate struck her Majesty with a cane.

'In Queen Victoria,' according to Macaulay, 'her subjects have found a wiser, gentler, happier Elizabeth.' No former monarch has so thoroughly com

prehended the great truth, that the powers of the crown are held in trust for the people, and are the means, and not the end, of government. This enlightened policy has entitled her to the glorious distinction of having been the most constitutional monarch Great Britain has ever seen. Not less important and beneficial has been the example set by her Majesty and her late Consort in the practice of every domestic virtue. Their stainless lives, their unobtrusive piety, and their endeavour to educate the royal children so as to be a pattern to every other family in the kingdom, have borne rich fruit in the stability of the throne, and have obtained for the royal family of England the respect of the civilised world.

The progress made by the nation in the various elements of civilisation, especially in that of material prosperity, has been almost unparalleled (see GREAT BRITAIN), and perhaps under monarchical institutions no greater measure of political contentment is possible than has blessed both sovereign and people during her unusually long and auspicious reign

VICTO'RIA, although one of the youngest, and, in point of area, the smallest, of the colonies of the Australasian group, is already the most important. In extent of commerce, indeed, it takes precedence of the other British colonies—India alone excepted. The extreme modernness, so to say, of the Australian colonial picture is one of its most striking features, for it belongs emphatically to the present generation. Men who might still be called young may recollect when the Port Phillip Settlement—the name first given to V.—had no existence; and those are not yet very old who may remember when even the geographical outline of Australia was incomplete, and when the great harbour of Port Phillip, now a busy scene of world-wide commerce, was undiscovered and unheard of.

Geographical Position and Extent.—V. comprises the south-east corner of Australia, at that part where its territory projects furthest into cool southern latitudes. Wilson's Promontory, to the south-east, the most southerly headland, just passes the 39th degree of S. lat.; while the most northern point, which is at the opposite or north-west extreme, is in S. lat. 34°. The long. comprises 9°—between 141° and 150° E. of Greenwich. To the W. is the colony of South Australia, separated by the 141st degree of E. long.; to the N. is New South Wales, separated by the line of the Murray River eastwards from 141° E. long. to its source, and thence by a straight line south-east to Cape Howe; and from Cape Howe to South Australia, again, the colony is bounded on the S. by Bass's Strait. The extreme length is east and west, and is about 500 miles, by an extreme width, north and south, of 300 miles. But a remarkable indentation of both the north and south boundary opposite each other, about the middle of the colony, reduces the breadth between the head of the Port Phillip inlet and the Murray to only 120 miles. The superficial area is 55,671,840 acres, or 86,831 sq. miles.

Physical Aspect.—Although V. may be called mountainous, as compared with the general flatness of Australia, it has much of the quiet and peculiar scenery characteristic of that division of the world. Vast naked plains are deviously traversed by broad and deep river-channels, which are mostly, however, mere chains of ponds, if not altogether dry, excepting in winter and spring, or after heavy showers. Overspread, in cool and moist seasons, with brilliant verdure, the drought and heat of summer quickly convert the grass into a natural hay, which, in the scarcity of sustenance from its ceasing to grow in that condition, is eaten off to the very roots by the sheep and cattle, leaving the surface a bare and blackened mass. The 'open forest' is another and very pleasing variety of scenery characteristic of Australia, and largely prevalent in Victoria. It distinguishes the gently undulating country of the better soils, whose surface is overspread by large trees, chiefly of the red gum (*eucalyptus*) and silver wattle (*acacia*). The trees being widely apart and of spare foliage, and the surface free from underwood, there is commonly a good growth of grass, the whole presenting a charming and park-like aspect, although felt to be somewhat tame and monotonous, especially under the great defect of most Australian landscapes, the general want of water. Mountain and forest prevail most in the east division, where the Australian Alps of Gipps' Land, the loftiest of Australian chains, culminate in an elevation (Mount Strzelecki) of 6500 feet above the sea. The west district, on the other hand, is chiefly remarkable for its numerous isolated hills of volcanic origin, some of them with craters still perfect, which probably have not, in a geological sense, been very long at rest. To this extensive volcanic system, V. owes the large proportion of its good arable land, as compared with the light sandstone and granitic soils that prevail elsewhere in Australia. The chief rivers, besides the Murray and its branches (elsewhere treated of), are the Snowy River, the Thomson, the Mitchell, the Macallister, and the La Trobe—all of Gipps' Land; the Yarra-Yarra, on whose banks Melbourne is built; the Barwon, the Hopkins, and the Glenelg, of which rivers, however, the three last are not perennial streams. Australian scenic peculiarities are incomplete without its very remarkable fauna, notably the kangaroo or pouched family, and the emu or great wingless bird. There are besides the *echidna* and *platypus*, of quite a different family, and even more singular in structure, especially the last, as indicated by its other name of *Ornithorhynchus paradoxus*. The dingo, or native dog, is remarkable as a non-marsupial exception, on which account it has been regarded as an introduction by human agency. But several years ago, Professor M'Coy of Melbourne met with its fossil remains associated with those of extinct animals, and in deposits that, although recent, geologically speaking, are in other respects so remote as to establish this animal's indigenous claim.

Climate.—This is on the whole healthful and agreeable, but subject to frequent and sudden change in condition and temperature. The average temperature of the year is between 57° and 59°, or about 9° above that of London, and 11° above that of Edinburgh. The common summer-heat is from 65° to 80°, with an occasional advance to 90°, and even to 100°, during hot winds and a dry season. The winter-range is mostly from 45° to 60°. Ice occurs in the midwinter of July, but it rarely, except on elevated ground, survives the noonday sun. Every few years, an unusually severe season will cover the higher levels, and even the country generally, with snow, to recall to the colonists the familiar scenes of ancestral homes. The cold of winter is keenly felt, and household fires are not uncommonly indulged in for even six months of the year, especially in the morning and evening.

Civil and Political Divisions.—Victoria is divided into four districts and 37 counties, the principal counties being Bourke, Talbot, and Grant. Prior to 1848 there were but three counties, the still existing Bourke, Grant, and Normanby, laid out in 1837, along with the sites of several chief towns, when the infant settlement, then but two years old, was officially taken charge of by the New South Wales government, within whose jurisdiction the territory

was then comprised. One chief object of the counties was to distinguish by certain special regulations the more accessible and valuable of the colonial lands, leaving the remainder (the districts) to pastoral or squatting uses. But the subsequent discovery of the gold-fields, in 1851, interfered with this arrangement, as the new condition created towns and markets indiscriminately in county and district. Squatting is still an important colonial vocation, second only to gold-mining, and still pursued over most of the colonial area. The electoral districts, in general, coincide (but not always) with county and municipal divisions. This is the case for the Assembly, but for the Council or Upper House, there is a special division of the colony into six great districts. A law of the colony specially facilitates townships to become municipalities; and there are already in V. (census of 1861) 61 such towns, all of them with their respective mayors and corporations.

History.—The distinction of first settling V. is due to the Messrs Henty of Launceston, Tasmania, who occupied the south-west part at Portland Bay with some flocks of sheep in 1834. But the settlement that mainly influenced the future was that of the following year upon the shores of Port Phillip. This enterprise also was from Launceston, first in May and June by a small party under Batman, which occupied Indented Head, on the west side, 15 miles inside the harbour; and again in August following by another party sent forth by Fawkner, he himself having been detained a short while longer by sickness. This last party passed on to the head of Port Phillip, ascended the Yarra, and settled upon the site of the present capital, Melbourne. The story of the subsequent progress is marvellous even in an age of marvels as to colonies. When the gold mines were discovered, the settlement, after 16 years' existence, had a colonial population of 80,000, of whom nearly one-third were in the capital. Thenceforth for several years the advance has scarcely been paralleled. The imports, exports, and the public revenue increased ten-fold. In 1856, Melbourne had become a city of great wealth and commerce, containing 100,000 inhabitants, while the colony comprised above 400,000. The race has since been at a more leisurely speed. Melbourne has not grown much larger, but it has been greatly improved and beautified. See MELBOURNE. Some interior towns, however, are rising to importance, in particular, Ballarat, erected beside the first-discovered of the principal Victorian gold-fields. Geelong, with 15,026 of population, finely situated on the western arm of Port Phillip, was long second only to Melbourne, but is now surpassed by Ballarat with 47,201, and Sandhurst with 21,987. The population of V., in 1871, was 730,198, of whom 330,478 were females.

V., while a part of New South Wales, was termed the Southern or Fort Philip District of that colony. As early as 1840, an agitation for separation and a government independent of that of New South Wales began, and was ended successfully in 1851, when the new colony received the name it now bears. The title of Lieutenant-governor was then given to the Queen's representative in this colony, as well as in others adjacent, the Governor-general being in New South Wales. But the rising importance of V. led to this distinction being discontinued some years afterwards. This importance indeed expedited, to these colonies, their concession of self-government, which was inaugurated about seventeen years ago (1854—1856), with very lively demonstrations on the part of the colonists, who have since shewn no want of interest or earnestness in the charge of their own affairs. During this last brief term, although the progress in point of population, owing to diminished immigration, has been unimportant, there has been a very marked advance in the improvement of the colony generally, and of the arts and industries and amenities of social and commercial life. At the Great International Exhibition of 1862, V. stood at the head of the entire colonial department, its contribution having been officially described as 'embracing the largest and most varied collection of objects ever sent by a British colony to Europe.'

Population, Colonists.—The population of V., in common with that of the other members of the group, is in the main English, in the wider sense of the word. The whole foreign element, according to the census of 1861, did not exceed one-tenth. Of that proportion, more than one-half was Chinese, whose sudden irruption into the colony, above 12 years previous, was at once one of the many novelties, as well as one of the doubtful benefits resulting from the world-wide fame of the gold-fields. The Germans are the only other foreign element of any noticeable strength. They began to arrive in 1849, Australia having become favourably known to them by a considerable preceding emigration to Adelaide. They have proved, on the whole, an advantageous immigration, for although slow to adapt traditional usages to their new circumstances, they have set a commendable, and often a much-needed example of frugality, industry, and sobriety. The various divisions of the United Kingdom contribute somewhat rateably their quota to the colonial population. The census of 1871 gave the numbers in connection with the various denominations as follows: Church of England, 257,835; Presbyterians, 112,983; Methodists, 18,191; Independents, 16,311; Roman Catholics, 170,620; Lutherans, 3540; Baptists, 10,559; Jews, 3571. There are in the colony 1232 churches and chapels, besides 325 school houses and 577 other buildings also used for public worship. Pop. in 1881, 858,582.

Natives.—By the census of 1871, the aborigines were found to number 1333, consisting of 990 males and 343 females. Probably about 200 more had missed enumeration. The number when the settlement began is usually stated to have been 6000, although probably much larger, seeing that Tasmania, only one-fourth of the extent, and with a climate less genial to savage life, is supposed to have contained 5000. But that is a point about which we can now only conjecture. The native is fast dying out from the colonised area. The progress of colonisation has been utter destruction to his prospects. Philanthropic and Christian efforts on his behalf, although not absolutely barren, have had but little fruit. He does not rise to the level of the surrounding civilisation. As his hereditary mode of life is now on every side interfered with, he pines away in a purposeless existence, a victim to the vices, without the virtues, of the new order.

Commerce.—Prior to gold-mining, wool was the great colonial staple. It is still of great importance, the exportation from V. in 1871 having amounted to 76,334,480 lbs. weight, of the value of £4,702,164. The gold export for the same year was 1,647,389 oz., of the value of £6,590,962. After the gold discoveries in 1851, there came an extraordinary commercial development. For that year, the imports had been £1,056,437, and the exports £1,422,909. In 1854, the amounts were respectively £17,659,051 and £11,775,204. But this sudden extension—at least as regarded imports—was not maintained, because it was due, in part, to a temporary extravagance, and partly because the colony has since then been successfully organising its industry, so as to produce fully as cheaply and as

well many articles that were at first imported. For 1871, the imports were £12,341,995, the exports £14,-557,820. The shipping in the same year comprised, in all, 1,149,004 tons—namely, inwards, 655,329; outwards, 493,675. The gold production of V. has gradually diminished from £12,000,000, to which it rose in 1856, to a little over £6,500,000 in the year 1871. This diminution is partly made up to the world by the greatly increased gold-mining of late in New Zealand. The yearly production of all these colonies is now about £10,000,000, distributed thus: V. 5; New South Wales, 2; Queensland, ½; New Zealand, 2½. The greater part of this gold is usually sent direct to Britain; but the proportion is very irregular, depending on the state of the exchange with India. Thus, while in 1865, £5,051,170 was received in England, in 1864 it was only £2,656,971, and the year before it was £5,995,368. The total of Australian and New Zealand wool received in 1871 amounted in value to the sum of £10,845,830. The exportation of articles, the produce of Great Britain, to V. amounted for 1871 to the value of £4,244,006, and for all the others of these colonies to £5,881,109, making a total of £10,125,115. The chief articles of this exportation are apparel and 'slops' (i. e., ready-made clothing), boots and shoes, haberdashery, cottons, woollens and worsteds, and iron in various stages.

The chief colonial vocations are squatting, or pastoral pursuits, agriculture, and latterly, gold-mining. The first-mentioned was the earliest that rose to importance; but the last has rapidly outrivalled every other. Agriculture, at first dwarfed by the success and influence of squatting, and for a time impede afresh by the social upturning during the first years of gold-mining, is now, however, rapidly extending, and is improving, socially as well as physically, the aspect of the country.

Squatting.—This colonial term has long since passed from its originally semi-savage and outcast associations, to represent in Australia a rural aristocracy. The squatter, using the country just as he found it, placed upon it his live-stock, which lived and throve on the natural herbage. This ready adaptation of the surface, with comparatively little of preliminary outlay, is the chief cause of Australia's rapid progress. At first, the pastoral 'stations,' or 'runs,' as they were then very appropriately called, were unenclosed areas, parcelled out to a small number with a very bountiful hand, and at a nominal rent or occupation license-fee. Now, however, these areas have been much subdivided, and much has been done in enclosing the runs with stout fencing. By a late official return, there were in V. 1156 different stations, comprising an area of 31,875,468 acres, and contributing to the revenue a yearly rental of £225,113, 17*s.* 7*d.* The rate is from ¼*d.* up to 8*d.* per acre, according to a valuation of pastoral capability. The present number of sheep in the colony is 10,002,381; of cattle, 799,509; and of horses, 181,643.

Agriculture.—Comparatively little was accomplished in this branch for 25 years, until 1860, when the government began to increase the facilities for acquiring and cultivating the public lands. In 1861, there were but 180,000 acres under the plough; in 1871, the area had increased to 909,015 acres, including 284,167 acres in wheat, and 149,309 in oats, these two being the cereals most cultivated in the Australian colonies. The average yield for the season 1870—1871 was: wheat, 10.1 bushels; oats, 15 bushels per acre. These figures shew a great falling off from those of previous years. The dry climate of Southern Australia seems favourable to the quality of wheat; and the Victorian samples at the last Great Exhibition ranked amongst the very best. There were 5523 acres in vineyard. Vine-culture rapidly extends, and wine-making is now general, with a large consumption in the interior districts, and periodical public sales of the vintages.

Gold-mining.—This may now be termed one of the skilled labours of the colony; but it is not by any means, on an average, among the most remunerative. Of the two great branches of mining, viz. (1) the crushing of the auriferous rock for the washing out of the gold, and (2) the washing from the débris or 'drifts' which nature has already pounded down ready to the miner's use, the latter, as embracing the simpler process, was at first the most general, but more lately the other has been increasingly followed. By means of improved machinery, quartz-crushing has been steadily rising to the position of a comparatively regular and sure source of living. There were, on March 1, 1871, about 58,220 persons in V. directly engaged in mining; and 941 sq. m. of auriferous ground were actually worked upon.

Finances.—The public revenue is derived mainly from three different sources—customs' dues, land-sales and rents, and public works. The total revenue of V. for 1870 amounted to £3,261,883. The chief items were—customs, £1,318,974; land-sales, £367,565; public works (chiefly railway receipts), £643,451. The revenue for 1871—1872 was £3,825,195, in proportions somewhat similar. The income is generally ample for all expenses. The outstanding public debt amounted (Dec. 1872) to £11,994,800. About ⅘ths of this amount represents the cost of the railway system now completed, and traversing the colony from Port Phillip to the river Murray. The remainder is the cost of water-supply to Melbourne and other parts of the colony, and of aids to Melbourne and Geelong for town improvements. This debt exists in the form of debentures, nearly all bearing interest at 6 per cent., and due at various terms up to 1891. These debentures are nearly all, excepting about one million, held in Great Britain, and are well known in the London market, the chief stock being 'The Railway Loan' of £7,000,000.

Taxation, according to the revenue accounts, amounts to a little over £5 per head. Deducting, however, the revenue from railways and from the sales of land, the amount per head is reduced by one-half, bringing it to about the same as in this country, although more equally distributed, owing to the greater equality of condition among the colonists, and more equal consumption of articles subject to customs' dues. The customs' revenue is derived mainly from strong drinks and tobacco. There are also moderate duties on sugar, tea, and coffee, and various other articles. Municipal and road-district taxation are additional.

Political Institutions.—The self-government conceded to V. and the adjacent colonies gives them a responsible system similar to our own. The governor represents the sovereign who appoints him; and he governs by ministries, who are of the crown's, that is, of the governor's nomination, but who must possess the confidence of parliament. There are two houses of legislation, both in V. being elective—the Council or Upper House by a high and special qualification, the Assembly by manhood suffrage, without any qualification for members. Elections are by secret ballot. The term of the governorship is usually seven years. The present salary of the office in V. is £10,000 a year; and in the expensive times more immediately succeeding the gold discoveries, it was £15,000. New South Wales allows he governor £7000. Judged by the criterion of salary, the Victorian appointment is the most important of the colonial list, the governor-generalship of India

excepted. The salary is paid wholly by the colony; but by a recent imperial act, the home government allows moderate pensions to retired governors, according to the term of service—a measure that had been called for in face of occasional reverses of fortune to the later life of persons who had previously represented royal splendour.

Religion.—The divergence of the British self-governed colonies from home example is perhaps most striking in two very important subjects—religion and education. In religion, as in politics, the tendencies are towards a complete equality, and therefore opposed to the privileges involved in church establishments. In this respect, change of scene, and equality and independence of condition, sensibly weaken the strength of tradition and usage as exhibited in the senior country. All religious bodies, therefore, stand alike before the civil power, none having any coercive jurisdiction except such as its own members voluntarily impose upon themselves, either by their own rules, or by a special act solicited from the colonial legislature. In V. there is still a yearly dotation of £50,000 from the public revenue to the support of religion. It is distributed rateably among the sects, Unitarians and Jews included, and is 'scheduled'—i. e., not subject to yearly vote—under the Constitution Act. This system had been introduced into Australia thirty years ago, as a substitution for the preceding Church of England supremacy. More lately, the public feeling had tended to a disapproval of this system of indiscriminate support to religion, and some of the smaller bodies had altogether rejected it. The state aid has therefore been abolished in some of the colonies. In V. a few years ago, after many trials, a bill passed both houses whereby the grant in aid of religion wholly ceased in 1875.

Education.—The energy displayed on this subject by the popular administrations of the self-governed colonies, and the tenacious persistence with which they encounter the problem of the education of the whole people, are among the best results presented to us by these young offshoots. Under the preliminary 'imperial régime' of colonial public life, the comparatively neglected field as to education is taken up, and with creditable zeal, by the various clergy, who institute, of course, the denominational system. But their main object being to inculcate their respective religious views, a general education of the people under this system, almost impossible anywhere, is altogether so in the thin populations of colonies. A national system, to compete with the previously established denominational, had been introduced into New South Wales and V. with the advent of the partially representative legislatures that for about twelve years preceded the present self-government. National and denominational, each conducted by a separate board of management, were alike aided by the state. After much debate, political and religious, the institution of a national system and of a single board was carried in the Victorian legislature in 1862. Four years afterwards, the same system carried in New South Wales, after similar debate and repeated failure. The system was in effect that all state assisted schools must be open to the children of all religious bodies, and that four hours daily of secular teaching be imparted to every pupil. This arrangement, on experiment, was unsuccessful. Schools still remained in connection with the several denominations; denominational school committees controlled the election of teachers, who were also permitted to impart religious instruction when desired. As a result, schools were unnecessarily multiplied in some localities, and the money of the state was wasted in their support. After various attempts to establish a system of state schools unconnected with any denomination—attempts which several of the religious bodies combined to defeat—the Victorian government, in the late session of parliament, succeeded in overcoming all difficulties, and a bill passed both houses of the legislature which completely establishes a national, as opposed to a denominational, system of education. The total number of schools in V. is 1867, including 908 'common' schools, with a total attendance of 154,353 scholars; total cost of maintenance, £249,762.

Remarks to Emigrants.—Intending emigrants should understand that V. is no longer a new and scantily-peopled territory, with all the superabundant employment and means of subsistence that are readily found now-a-days on such a scene by help of the arts and implements of an advanced civilisation. There are now in the colony the advantages of a settled society, having much of the amenities of home-life; but, on the other hand, the colonial vocations are tolerably filled up by the increasing population, so that the unsuitable or the inexperienced have hardly any better chance out there than here. It is owing to considerations of this kind that the system of free or assisted emigration—a system still maintained to a limited extent by the colony—has been latterly conducted upon very strict principles; the object being, that persons unsuitable to the colony may, as far as possible, be prevented from going there. The government emigration is now placed under the care of the Commissioners for Emigration, Park Street, Westminster. The latest regulations are those of July 1865, and they give free and assisted passages to certain eligible persons of both sexes, with special encouragement to the emigration of females. The *free passages* are given to domestic servants of from 18 to 25 years, and to married agricultural labourers and their wives not exceeding 40 years, with not over two children under 12 years. All must provide proper outfit, and pay besides 10*s.* per adult towards bedding as supplied to them on shipboard. There is also, to a limited extent, a system of *assisted passages*, by which suitable persons are granted passages, subject to their paying a part of the cost. The payment varies from £1 for females, and £2 for males, above 15 years, up to £5 and £8 respectively for those of 40 years and upwards. A third system enables residents of the colony to bring out eligible persons of their own nomination, by taking out *passage warrants*, subject to like payments and conditions as those just given. In all cases, there is special encouragement to female emigration, as there is still a marked sexual disproportion in the colony. As a general rule in V. at present, wages and remuneration generally are one-third or one-fourth higher than in England; while the chief requirements of life are, one with another, at about the same price as they are in the latter country. House-rent is rather higher, while butcher-meat is cheaper, and other articles about equal. The climate is, as a whole, highly enjoyable, with its bright skies and sunshine; but to working-men, six months of the year (from the middle of October to the middle of April) will be found somewhat oppressive for great physical toil—a consideration no doubt present to the working-classes of the colony in connection with their successful introduction of an eight-hours' labour system. There are now more facilities than the colony formerly enjoyed for acquiring land at a reasonable price, and the climate has been found quite suitable for the cultivation of all the cereal crops of this country, as well as the grape and other fruits, the gift of a temperature more genial than that of England.

VICTORIA, a city, capital of the colony of British Columbia, stands at the south-east extremity of Vancouver's Island, 320 miles from Portland, Oregon. Three miles from V. is the harbor of Esquimault, the western terminus of the Canada Pacific Railway. V. was originally a trading establishment or fort of the Hudson Bay Company, but now contains churches of the various denominations, several hotels, about 40 stores, 4 breweries, ship-yard, &c. Two daily and two weekly newspapers are published here. Value of imports in 1872, \$1,790,352; exports, \$1,915,107. Pop. 5925. See VANCOUVER'S ISLAND.

VICTORIA, a seaport of Brazil, capital of the province of Espiritu Santo, stands on a bay of that name, 270 miles north-east of Rio de Janeiro. It has a good harbour, an active coasting-trade, and about 6000 inhabitants.

VICTORIA, a genus of plants of the natural order *Nymphæaceæ*, resembling the common water-lily, but most nearly allied to the genus *Euryăle*, and distinguished from it particularly by the deciduous tips of the calyx, and the sterility of the innermost stamens. Only one species is yet known, *V. regia*. This is said to have been first observed by Hänke, about 1801, and afterwards to have been seen by Bonpland, D'Orbigny, and others. It was first described in 1832 by Pöppig, who observed it in the river Amazon; and it has since been found by Schomburgk and others in many rivers of the north-east of South America. Its leaves are orbicular, float upon the water, and attain a diameter of 5—6 feet; have the margin turned up, and about two inches high; are of a purplish colour on the under side, and there exhibit a sort of wicker-work of very prominent veins, furnished with prickles. The flowers rise amongst the leaves upon prickly stalks. They are more than a foot in diameter, white, internally rose-coloured, and are very fragrant. The fruit is a capsule, almost globose, with a depression on the top, about half the size of a man's

Victoria regia, flower and leaf.

head, fleshy within, and divided into numerous cells, full of round farinaceous seeds, which are an agreeable article of food. The plant is therefore called *Maïs del Agua*, or Water Maize, in some parts of South America. To the cultivation of this plant, special hothouses have been devoted in some places in Britain and also in the United States. It has been introduced into India from seeds produced in England.

VICTORIA BRIDGE, across the St Lawrence at Montreal, on the Grand Trunk Railway of

Victoria Bridge, Montreal.

Canada. This, the greatest tubular bridge in the world, was begun in May 1854, and finished in December 1859. The engineers were Robert Stephenson and Alexander M. Ross. The dimensions and other particulars are stated in the article TUBULAR BRIDGE; and the accompanying view will help to give a conception of the vastness of the structure.

VICTORIA CROSS. See CROSS, VICTORIA.

VICTORIA LAKE, called also ALEXANDRINA or KAYINGA LAKE, a brackish lagoon in the south-east of South Australia, is separated from the sea only by a narrow belt. It receives the rivers Murray, Bremer, Angus, and Finnis, and communicates with the sea by a narrow passage that leads into Encounter Bay. It is 30 miles long, and about 12 miles broad. A sand-bar at the entrance to the lake impedes access for vessels from the sea; but the interior navigation is safe.

VICTORIA-NYANZA. See NYANZA.

VICU'GNA (*Auchenia Vicugna*), a species of the same genus with the lama and alpaca. It is a more beautiful animal than any of its congeners. In size, it is intermediate between the lama and the alpaca. Its neck is longer and more slender than theirs; its wool is also finer, short, and curled. It is of a rich brown colour, with patches of white across the shoulders, and the inner side of the legs. The V. inhabits the most desolate parts of the Cordillera, at great elevations; and delights in a kind of grass, the Ychu (*Stipa Ychu*), which abounds there in moist places; but it seldom ventures to the rocky summits, for which its tender feet are ill adapted. It is commonly found in small herds of from 6 to 15 females with one male. When the females are quietly grazing, the male stands apart, and carefully keeps guard, giving notice of danger by a kind of whistling sound, and a quick movement of foot. When the herd takes to flight, the male covers their retreat, often pausing to observe the motions of the enemy. If he is wounded or killed, the females gather round him, and will suffer themselves to be captured or killed, rather than

desert him. The V. is a very active animal, like the wild goat or the antelope. The Indians seldom kill it with firearms, but set up a circle of stakes, about a mile in circumference, into which the vicugnas are driven.—A hybrid has been produced between the V. and the alpaca, which has a black and white fleece of long wool, resembling the richest silk.

VIDOCQ, François-Jules, who acquired notoriety as a detective-officer of police at Paris, was born on 23d July 1775, at Arras, where his father was a baker. On the principle of set a thief to catch a thief, his earlier life may be regarded as an almost invaluable apprenticeship to the profession in which he afterwards became distinguished. As a boy, he was employed in his father's shop, the till of which, it was found, he persistently robbed. To cure him of this evil habit, he was sent to the house of correction; but so little were his morals improved there, that he signalised his return to business by decamping with a sum of about £80. Of this money, a sharper relieved him at Ostend; and in order to keep himself in life, he engaged himself to sweep the cages of a travelling menagerie. From this menial service he was advanced to the post of tumbler and acrobat; and a further promotion was intended him to that of a supposed savage, whose performance involved the eating of raw flesh, and drinking greedily of blood. As he saw fit to decline the appointment, his further services were dispensed with; and shortly after, he returned to his father. Having entered the army, he attained the rank of corporal, and served with some credit in Belgium and elsewhere, till a wound obliged him to return home. For some years after, he seems to have lived as a scoundrel at large, occupying himself in swindling and disreputable love-affairs. In 1796, he turned up in Paris, and being detected in forgery, he was sentenced to pass eight years as a galley-slave. Before his term of durance had expired, he found means to escape, and became one of a band of highwaymen. As the story goes, his new associates, on chancing to discover that he was an escaped galley-slave, saw fit to decline his further acquaintance. This refinement of squeamishness on the part of these gentlemen of the road, seems not in itself very probable; but on whatever ground of dislike, they desired to rid themselves of M. V., and summarily did so, exacting from him a solemn oath not to betray them. M. V. took the oath very solemnly, and instantly proceeded to deliver the whole gang into the hands of the authorities. This pretty exploit seems to have suggested to him the *rôle* which he afterwards developed with such consummate success. Hieing to Paris, he offered his services to the authorities there as a spy upon the criminal classes. His advances were at first coolly received; but gradually he made his way; and shortly his services became so important that official recognition was vouchsafed him. In 1812, a 'Brigade de Sûreté' was organised, with V. as chief. Consisting at first of only 4 men, by degrees it was enlarged till it came to include 28; and its efficiency was something marvellous. Suspicions, however, grew rife that V. was himself the originator of many of the burglaries he shewed himself so clever in hunting out, and even contrived to make a good thing of them. It does not appear that this charge was in any case clearly brought home to him; but M. V. being plainly the sort of person in whom any suggested blackguardism is rather more likely than not, it had every inherent probability. Guilty or not as he may have been, so strong was the popular feeling against him that, in 1825, it led to his being superseded. After his dismissal, he became a paper-manufacturer; and in 1834, established a Trade Protection Society, the object of which was to furnish confidential information as to parties whose credit might be dubious. In 1829, he published an Autobiography, a *rédaction* of which he put forth in 1844 (Eugène Sue's famous novel having just taken the public by storm), under the title of *Les Vrais Mystères de Paris*. Finally, he died in Belgium in the year 1850.

VIE'NNA (Ger. *Wien*, Lat. *Vindobona*), capital of the Austrian Empire, stands on a plain, surrounded by gently-sloping hills, 251 miles south-east of Prague by railway. An arm of the Danube, serving the purpose of a canal, passes along the north-east side of the city, and separates it from the suburb of Leopoldstadt. Into this arm flows a foul and insignificant stream, called the Wein, and from this stream the old city derives its name. V. consists of the old city or inner town, nearly a mile in length, and half a mile in breadth, with narrow streets, and about 55,000 inhabitants, and of a circle of suburbs 36 in number, which completely surround the central part. All around the old town, and between it and the suburbs, is a ring of open space from 600 feet to 15,500 feet broad, covered with grass, laid out in walks and in avenues planted with acacia and chestnut trees. This space was the glacis of the fortifications, which, since 1857, have been demolished. The suburbs are of comparatively recent erection—the former suburbs having been destroyed on the occasion of the last siege of V. by the Turks in 1683. The streets of V.—broad and straight in the suburbs—all run to a point in the centre of the inner city, like the spokes of a wheel, or the converging threads of a spider's web. Surrounding the suburbs is a wall over 12 feet high, and pierced by 13 gates. This wall forms what are called the *lines* of Vienna. Unlike most other European cities, the old part of the city is the most fashionable. In the old or inner town are the palaces of the emperor and of some of the principal nobility, many stately mansions, the public offices, the finest churches, most of the museums and public collections, the colleges, the exchange, and the most splendid shops. The suburbs are laid out in wide streets, many of which, being unpaved, are muddy in winter, and dusty in summer. Among the principal squares are the *Josephsplatz*, with an equestrian statue of the Emperor Joseph II.; the *Burgplatz*, with a colossal bronze statue of the Emperor Francis; the outer *Burgplatz*, with an equestrian statue of the Archduke Charles; the *Neumarkt*, with a fountain embellished by four figures, representing the rivers of the archduchy of Austria—the Ens, Ips, Traun, and March; the smaller square, called the *Freiung*, with a much more beautiful fountain, adorned with five figures, representing Austria and the four chief rivers—the Danube, Vistula, Elbe, and Po—of the Austrian dominions. V. is the see of an archbishop; and of all its churches, of which there is a large number, the chief is the cathedral of St Stephen's, one of the most beautiful Gothic edifices in Germany. It is 345 feet long, 230 feet in greatest breadth; was founded—on the site of an older church, parts of which still remain—in 1359, and completed in 1480. It is roofed with coloured tiles, and its exterior presents much rich tracery and curious carvings and monuments. The interior is gloomy; but the lofty nave, the pillars of extraordinary size, the rich sculptures, and the old brilliant painted glass, combine to render it very beautiful. The south tower, a masterpiece of Gothic architecture, was 449 feet in height in 1864; but in that year, when the spire was being restored, it was intended to increase the height by 15 or 20 feet. The Capuchin Church contains the burial-vault of the imperial family; the Church of the Augustines is remarkable

for its monument of the Archduchess Christina of Saxe-Teschen, one of the most successful works of Canova. Other important churches are those of Maria-Stiegen, in the purest style of Gothic; the *Votif-Kirche*, also a noble Gothic structure; and the New Synagogue, superbly decorated in the interior. The Imperial Royal Palace is an ancient building consisting of various parts erected at different times. Adjoining the palace, or forming part of it, are the Imperial Library, Riding-school, Jewel Office, several collections, and the Burg Theatre. The Archduke Albert's Palace contains a library, and one of the finest collections in Europe of engravings and drawings, comprising among the latter Raphael's own sketch of the Transfiguration. The Imperial Arsenal contains manufactories of all sorts of weapons, and an armoury containing one of the largest and finest collections of arms and ancient armour in Europe. The Ambras Museum contains the most interesting collection of armour of the 16th c. in Europe, besides collections of art-treasures, and many excellent pictures, among which are several by Paul Veronese, Titian, Raphael, Salvator Rosa, the Caracci, Correggio, Rubens, Van Dyck, Ruysdael, and others. There are other collections of pictures, as those of Count Czernin and Count Schönborn. The Polytechnic Institute is attended by 500 pupils, who are taught in science, the arts, and in trade, commerce, and manufactures. The university, founded in 1237, is attended on an average by 2000 students, more than half of whom receive gratuitous instruction. The professors, about 80 in number, receive their salaries from government. As a school of medicine, the university of V. is celebrated over the continent. There are numerous schools and charitable and benevolent institutions. Among the latter are the General Hospital, with accommodation for 3000 patients. The glacis, already mentioned, the private gardens attached to the palaces of Prince Schwarzenberg, the *Augarten*, and the *Prater*, the last being the Hyde Park of V., are the principal places of public resort and recreation. V. contains eight theatres, of which the *Hofburg* and the *Kärnthnerthor* theatres, and the *Theater an der Wien*, are the chief. The manufacture of silk-stuffs is an important branch of industry, and 4000 persons are employed in the weaving of shawls. But the most flourishing trade is the manufacture of meerschaum pipes, in which much skill and artistic taste are displayed. Glove-making is also carried to much perfection, and the trades and manufactures common in large capitals are carried on. Pop. (1869) 607,514; (1873) of V. and suburbs proper about 850,000; and in 1880, 1,003,857. See AUSTRIA.

VIENNA, TREATIES, &c., OF. This capital, from its central position, and from the prominent part which Austria has always taken in the wars of modern Europe, has been oftener selected than any other city (Paris perhaps excepted) as the meeting-place of the representatives of the various European nations. The *first* treaty of V. (April 30, 1725) was a mutual guarantee of their dominions by the Emperor Charles VI. and Philip V. of Spain; besides which, the former agreed to aid in the recovery of Gibraltar from Britain, and to aid the Pretender in supplanting George I. in consideration of the latter guaranteeing the Pragmatic Sanction. The *second* treaty (March 16, 1731) was a joint guarantee of the Pragmatic Sanction by George II. of Britain and the States of Holland. The *third* (November 18, 1738) was a similar guarantee by Louis XV. of France, in consideration of the reversion of Lorraine and Bar (to be given meantime to Stanislas, the ex-king of Poland), as well as a settlement of the Polish succession dispute, and a rearrangement of the possessions of Austria, Spain and Sardinia, in Italy. The *fourth* treaty (October 14, 1809) was concluded between France and Austria, after the battle of Wagram, and the armistice of Znaim, by which the latter agreed to resign some districts on the western border of the archduchy to Bavaria; Goritz, Friuli, Trieste, Carniola, and parts of Croatia, Carinthia, and Dalmatia. to France, these provinces to be formed into the government-general of Illyria; some districts of Upper Lusatia to the king of Saxony; Western Galicia, with Cracow and Zamocz, and a share in the salt mines of Wielicza, to the grand duchy of Warsaw; and the eastern corner of Galicia to Russia: a total loss to Austria of 58,170 sq. m., with a pop. of 3,500,000, and all her seaports.

The next, and by far the most important meeting of the representatives of European nations, was the *Congress of Vienna*, which was held here after the first treaty of Paris, for the general settlement of the affairs of Europe. The congress, which first met on September 30, 1814, was composed of the Czar Alexander I. of Russia, with Count Nesselrode; the king of Prussia, with Hardenberg; Lord Castlereagh, and afterwards the Duke of Wellington, as representatives of Britain; Prince Metternich for Austria; Count Talleyrand for France; as well as representatives of Spain, Portugal, Sweden, Rome, Germany, and all the other minor powers, who were interested personally in the deliberations: the total number of those who assisted at the congress being about 500. But the representatives of the minor states, who had expected a species of European parliament, to which all would be admitted, were sadly disappointed by the preliminary resolution of the great powers to constitute two committees, one of which would deliberate on the affairs of Germany; and the other, composed only of the representatives of Austria, Prussia, Russia, and Britain, would discuss the affairs of Europe generally, decide respecting the partition of the conquered districts (formerly belonging to France and her allies), and the frontier of each European sovereignty. To this latter council, Talleyrand, by the influence of Castlereagh, who early saw the necessity of a counterpoise to the influence of Russia and her follower, Prussia, in the conferences, was admitted (October 5); and three days after, it was increased by the representatives of Spain, Sweden, and Portugal. The first resolution of the European committee, to rearrange Europe so as to leave the parties directly interested nothing more to do than give their adhesion to the arrangements made for them, being an arrogation of sovereignty over all Europe, was loudly exclaimed against; but the congress was one of rulers and *their* representatives, and not of the nations and *their* representatives, so the indignant clamour which rose on all sides was quite unheeded. The points which were at once and unanimously settled were—the constitution of Belgium and Holland into one kingdom (*the kingdom of the Netherlands*); the annexation of Norway to Sweden; the restoration of Hanover, with a large slice of Westphalia, to the king of Great Britain; of Lombardy to Austria; and of Savoy to Piedmont. But the questions as to the disposal of Poland, Saxony, and Genoa were not so easily settled. Russia and Prussia, overweeningly vain of the prominent share they had had in crushing Napoleon, were bent on aggrandisement of the most extravagant sort; the former loudly insisting on obtaining the whole of the grand duchy of Warsaw (see POLAND); while nothing less than the whole of Saxony, and some of the trans-Rhenish provinces of Westphalia, would satisfy the latter; and both significantly

hinted at the proximity of their colossal armies, with the view of awing the other powers into compliance. But Castlereagh was not the man to be so influenced; and while steadily refusing to yield an iota to such preposterous pretensions, he joined with Metternich and Talleyrand in a secret treaty, offensive and defensive, February 3, 1815; which was cordially acceded to by Hanover, Sardinia, Holland and Bavaria. The news of this agreement soon leaked out, and produced a considerable modification in the pretensions of the northern powers. At last it was agreed that Prussia should obtain a portion of Saxony (now Prussian Saxony), Posen, Cleves, Berg, the greater part of the left bank of the Rhine as far as the Saar, and Swedish Pomerania; and cede East Friesland, Hildesheim, &c. to Hanover, Anspach and Baireuth to Bavaria, and Lauenburg to Denmark: while, with the exception of Posen, Thorn, and those parts of the grand duchy which had been (1809) taken from Austria, Poland was to be erected into a kingdom separate from Russia, but under the rule of the czar. Austria recovered the cessions which she was forced to make in 1809, obtained also the Valteline from Switzerland, and the establishment of collateral Hapsburg lines in Tuscany and Piombino; while Maria-Louisa obtained Parma. The pope was replaced in his former position as a temporal sovereign; the ancient constitution of Switzerland re-established; and Genoa—despite the strongly expressed aversion of its inhabitants—incorporated with Sardinia. The news of Napoleon's return from Elba somewhat hurried the conclusion of these multifarious arrangements, yet the negotiations were not interrupted; Metternich's scheme for a new confederation of the German states (the same which has continued till 1866) was unanimously agreed to, the question of mutual indemnities, rectifications of frontier, &c., being subsequently settled (July 20, 1819) at Frankfurt, by a territorial commission composed of representatives of the four great powers. The questions of the slave-trade and of the free navigation of the Rhine and its tributaries, were brought up by England, and also satisfactorily settled. Finally, a formal treaty (the *fifth treaty of Vienna*) was drawn up and signed, June 9, 1815.

VIENNA PASTE is a preparation which is extensively used as an encaustic, although it is not contained in the Pharmacopœia. A mixture, termed *Potassa caustica cum calce* (Caustic potash with lime), which is itself a caustic, and is much employed for producing issues, is first prepared by mixing equal weights of caustic potash and freshly-burned lime in a warm mortar, and rubbing them to a powder, which should at once be placed in an air-tight bottle. The caustic powder of which Vienna paste is made is obtained by similarly mixing 50 parts of the preceding compound with 60 of quicklime. It must be kept in a well-stoppered bottle; and when required for use, the powder is made into a soft paste with a little spirit, and applied to the part it is desired to cauterise. It is much employed by some physicians in certain affections of the womb; and is one of the best applications to an indurated chancre. See SYPHILIS.

VIENNE, an interior dep. in the west of France, bounded on the N. by the deps. Maine-et-Loire and Indre-et-Loire, and on the W. by Deux-Sèvres, which intervenes between this and the maritime dep. of Vendée. Area, 2690 sq. m.; pop (1872) 320,598. The Vienne, an affluent of the Loire, is the principal river, and all the other streams of the dep. are tributary to it. It flows from south to north, and receives the Clain, Gartempe, and Creuse—of these, the last only is navigable. The surface is flat, with a gradual slope toward the north. The country consists almost wholly of fertile plains, fine pasture-lands, and extensive forests. The climate is soft, temperate, and healthy. Grain is cultivated in greater quantity than is required for local consumption. On an average, 13,200,000 gallons of wine are produced annually. In general, however, agriculture is in a backward state. The mineral riches of the department consist principally of iron and manganese, and numerous quarries of building and other stones, including lithographic stones, which are finer and harder than those of Munich. The dep. is divided into the five arrondissements of Poitiers, Châtelherault, Civray, Loudun, Montmorillon. Poitiers is capital.

VIENNE, one of the most ancient towns of France, in the dep. of Isère, on the left bank of the Rhone, 19 miles south of Lyon by railway. The river Gère passes through the town, and here joins the Rhone, after having supplied motive-power to a number of mills and factories. V. was the chief town of the Allobroges, is mentioned by Cæsar (*De Bello Gallico*, vii. 9), and by Martial, who terms it *opulenta Vienna.* At the time of the Roman emperors, it was the rival of Lyon. Besides numerous water-conduits, &c., of Roman construction, there is a temple supposed to have been dedicated to Augustus, and which is now used as a museum, and contains a number of ancient Roman remains. There are also a Roman arch, remains of a theatre, and an obelisk, called L'Aiguille, 72 feet high; and the cathedral of St Maurice, a stately Gothic edifice, with much delicate carving. Manufactures of coarse woollens are carried on; and there is a good trade in wine. Population (1872) 19,844. In 1312, a council was held here, in which Pope Clement V. pronounced the suppression of the order of the Templars.

VIENNE, HAUTE, an interior dep. of France, bounded on the west by the deps. of Vienne, Charente, and Dordogne; area, 2130 sq. miles; pop. (1872) 322,447. It is watered by the Vienne and its tributaries—the chief of which is the Gartempe. The surface is for the most part level; but traversed by ranges of low hills, of which the Monts du Limousin, which traverse the south of the dep. from east to west, rise in their highest summit to 3000 feet. The Mont de Puy-Vieux, the highest in the dep., is 3200 feet above sea-level. The climate is cold, humid, and frequently foggy. The soil is not fertile, and agriculture is in a very backward condition. There are, however, extensive meadows, and the domestic animals are reared in great numbers. Mines of iron, lead, and copper are worked. The dep. is divided into four arrondissements. Capital, Limoges.

VIERSEN, Prussia. See SUPPLEMENT in Vol. X.

VIETA (otherwise given VIET, VIETTE, or DE VIETTE, and by himself Latinised into VIETÆUS), FRANÇOIS, the most eminent French mathematician of the 16th c., was born at Fontenai-le-Comte, near La Rochelle, in 1540. Of his early life and education we know nothing, and almost all our acquaintance with the details, meagre as they are, of his personal history, is derived from the records of his friend, De Thou (q. v.). V. was employed throughout his whole life in the service of the state under Henry III. and Henry IV., and devoted only his hours of leisure to the study of mathematics and other subjects—affording an excellent illustrative argument against the belief that abundant leisure is essential to high eminence, and in favour of the contradictory theory that mental work of whatever sort tends to prepare the mind for any other species of thought-labour. V. was a zealous

Roman Catholic, and a strenuous supporter of the doctrine of the divine right of kings. His genius and persevering industry brought him prominently into notice on various occasions. During the war against the Spaniards, the latter, to preserve as much as possible their communications with their numerous outlying possessions, and prevent the French from profiting by information from intercepted letters, adopted a species of cipher (see CRYPTOGRAPHY) of more than 500 characters, each varying from time to time in its signification. Some specimens being intercepted, were submitted to V., who after a time discovered the key to the cipher, to the great discomfiture of the Spaniards, who, incapable of accounting for the discovery otherwise, attributed it to magic; though the story that V. was summoned to Rome to defend himself before the pope against the charge of having dealings with the devil may safely be regarded as untrue. V.'s next prominent appearance was as an assailant of the Gregorian calendar, in opposition to which he published (1600) a 'true Gregorian calendar,' which was with justice considered by his contemporaries as inferior to that which obtained the papal sanction. However, V. did not, or would not, see his error, and attacked the Jesuit Clavius, to whom the pope had intrusted the compilation of the calendar, in a bitterly abusive manner; displaying, however, such a mastery of knowledge, that one of Clavius' defenders was led to sympathise with the unfortunate Jesuit who had to withstand the assault of one who was at once a lawyer, theologian, mathematician, orator, and poet. V., however, is almost exclusively recognised by posterity as a mathematician; yet, though worthy to rank among the highest of this class, immediately after such men as Newton and Lagrange, the incessant state of politico-religious turmoil in which France was kept during his life, and the fact that all his works printed during his life were set up at his own expense, and distributed among his friends, have hitherto hindered a general recognition of his high merit. The Italian tabulators of the progress of mathematical science have thus had a good opportunity of decking out their national idols (Cardan, especially) with plumes stolen from the obscure French investigator. The claims of V., however, are now becoming more and more generally recognised. He is indisputably entitled to be considered as the creator of modern algebra, which he established on the footing of a purely symbolical science; he applied his algebra to the extension of trigonometry, discovering the relations of multiple angles; and he extended the ancient process of extracting square and cube roots to the solution of all equations, an extension which has been since modernised and modified, and now appears as *Horner's method*. Besides, he proved his superior mathematical powers, by solving problems which had puzzled Apollonius, Regiomontanus, &c.; and was acknowledged by the mathematicians of Belgium and Italy as their master. Yet, strange to say, his own countrymen, the French, have so little knowledge of the surpassing talents and achievements of V., that, omitting all intelligent mention of his peculiar successes, they ascribe to him praises due to his Italian predecessors, and to his great English successor, Newton. Most of V.'s works were collected by Schooten, and published by the Elzevirs, at Leyden, in 1646. Two other works of his have been recently discovered, the *Harmonicon Cœleste* and the *Canon Mathematicus*, the latter the first table in which the trigonometrical functions of an angle are completely given. Of the first, two MSS. exist; while the second was printed and circulated according to V.'s usual fashion, and has long been a bibliographical curiosity; but neither has yet been published. See Knight's *Eng. Cyc.*, art. 'Vieta.'

VIGAN, LE, a small, prettily situated town in the south of France, in the dep. of Gard, 45 miles west-north-west of Nîmes. It carries on a trade in wine, oil, mules, horses, and silk. Silk and cotton fabrics are manufactured; and hides are tanned, known as Vigan hides. Pop. about 6000.

VIGE'VANO, a town of Northern Italy, in the province of Novara, 15 miles south-east of the town of that name. It stands on a rising ground on the banks of the Mora, and is surrounded by walls. It manufactures silk, linen, and cotton fabrics, and has an active trade in grain and wine. Pop. 17,673.

VIGIL (Lat. *vigilia*, Fr. *vigilo*, I watch), a preparatory time of devotion, which, by a very ancient Christian usage, went before the more solemn festivals, and especially Christmas, Easter, Pentecost, and the principal martyrs' days. In English, it was called 'Eve' or 'Even,' a name which is still retained in relation to several festivals, as Christmas Eve, Hallow-e'en, &c. The observance is traceable in the very earliest centuries, and was established everywhere in the 4th and 5th centuries. It is one of the usages of his time against which Vigilantius inveighs, and which Jerome vindicates in his celebrated *Letter against Vigilantius*. On the day before the great festivals, which seems from the first to have been held as a fasting-day, the people assembled in great multitudes. The services proper to the vigil, but having a certain bearing on the coming festival, were celebrated; the night was spent chiefly in the church and in prayer, and other devotional exercises; but abuses arose out of these night-watches, which led to their suppression, as well as to the abolition of certain festivities which grew up in connection either with the vigil or with the feast itself. The observance of vigils is still retained in the Roman Catholic Church, and with it all the ecclesiastical offices, together with the fast, at least in the great vigils of Christmas, Easter, Pentecost, Saints Peter and Paul, Assumption, All-Saints, &c.; but all the other details of the celebration have gone into disuse. In the English Prayer-book, the 'vigils or evens' of the chief festivals of our Lord, of the Blessed Virgin Mary, and of the Apostles are retained in the Calender; but they have no special services appointed for them, nor any other celebration.—See Blunt's *Annotated Common Prayer*, p. 28.

VI'GNETTE (Fr. little vine, a tendril; Lat. *viticula*), a term originally applied to the flourishes in the form of vine tendrils, branches, and leaves with which the capitals in ancient manuscripts were often surrounded. Similar decorations were introduced into printed books, and all kinds of printers' ornaments, such as head and tail pieces, came to be designated as vignettes. More recently, the name has been applied to engravings not enclosed in any definite border, and which are generally placed on the title-page of a book, opposite to the frontispiece.

VIGNY, ALFRED, COMTE DE, a French poet and novelist, was born at Loches in Touraine, March 27, 1799, and educated at Paris. After spending some time as a soldier, he married, in 1826, a wealthy Englishwoman; and two years later, withdrew from the army, in order to devote himself exclusively to literature. He died September 18, 1863. V. belongs to the Romantic school, but is free from all their extravagance of style and sentiment. No modern French poet exhibits an equal refinement and delicacy. His principal works are *Poëmes* (1822), *Poëmes Antiques et Modernes* (1824—1826), among which are his famous *Moïse*, *Dolorida*, and *Eloa*;

Cinq-Mars (1826), a historical romance of the time of Louis XIII., which is much admired in France, and has gone through more than a dozen editions; *Stello ou les Diables Bleus* (1832); *Servitude* and *Grandeur Militaires* (1835)—two very striking and suggestive novels; *La Maréchale d'Ancre*, and *Chatterton* (1835)—dramas of considerable merit. Besides these, he published *Consultations du Docteur Noir* (1856). A posthumous work appeared in 1864, entitled *Les Destinées, Poésies Philosophiques.*

VI'GO, an ancient town and seaport on the north-west coast of Spain, beautifully situated on a bay of the same name, about 85 miles north of Oporto. Its delicious climate renders it important as a medical station; and its position on the slopes of a hill, overlooking a charming bay, and forming the centre of a scene, oriental in its wealth of palms, orange-groves, flowers, and orchards, is likely to tell in its favour as a residence for the rich. Its old walls and gates; its winding, narrow streets; its houses, white-washed, or coloured red or green; the craft which frequent its harbour, and the picturesque dresses of the peasants, are delightful to the artist, as well as to the ordinary observer. The country in the vicinity is exceedingly rich, and fruits, corn, wine, and oil abound. The trade of the port—which is also a harbour of refuge—is increasing. About 2500 vessels, of 300,000 tons, entered and cleared the port. Pop. 8500.

The Bay of Vigo has an inland sweep of 20 miles, and is 5 miles wide at its mouth. The town has frequently been attacked by the English: by Drake in 1585 and 1589; by the Duke of Ormond, Rooke, and Stanhope in 1702; and in 1719 by Lord Cobham.

VIHÂRA (which, in Sanscrit, means, 'walking for pleasure or amusement') is, with the Buddhists (q. v.), the name of their temples and convents. Originally, it designated the hall or halls where the Buddha S'âkyamuni, and the priests by whom he was accompanied, used to meet; but when these halls gradually were converted into temples, the name of *Vihâra* was applied to them; and when, in time, the temples became the centre of a number of habitations in which the priests belonging to the temples resided, the whole monastic establishment was comprised under the same name. Properly, therefore, the Vihâra merely designates the Buddhistic temple, and it is generally used in this restricted sense. Such Vihâras are in Ceylon permanent structures, the walls being plastered, and the roof covered with tiles, even when the dwellings of the priests are mean and temporary. Near the entrance are frequently seen figures in relievo, representing the guardian deity of the temple. Surrounding the sanctum there is usually a narrow room, in which are images and paintings; and opposite the door of entrance there is another door, protected by a screen; and when this is withdrawn, an image of Buddha is seen, which occupies nearly the whole of the apartment, with a table or altar before it, upon which flowers are placed. The walls of the Vihâra are covered with paintings, and its stories generally illustrate some legend of Buddha's life. Some Vihâras are built upon rocks; others, and amongst these the most celebrated, are caves, in part natural, with excavations carried further into the rock. The Cave-temple at Dambulla is one of the most perfect Vihâras in Ceylon (see the description of it by Forbes in the *Ceylon Almanac*, 1834). On the continent of India, the finest specimens are those at Ajunta, Ellora, Salsette, and Junir. Sometimes no land is attached to the Vihâras, but sometimes also they are rich in lands; and in the case of one of the Vihâras in Kandy, there is an area belonging to it, which, under the native government, was regarded as a sanctuary for malefactors.—See R. Spence Hardy *Eastern Monachism*, and the authorities quoted there (London, 1850).

VI'KING (plural VIKINGR), a name given to the piratical Northmen who infested the coasts of the British Islands and of France in the 8th, 9th, and 10th centuries. This word is quite unconnected with 'king,' being derived from the Scandinavian *vik*, a bay; and this class of marauders were s called because their ships put off, not like the king' ships, from the lawful harbour, but from the bay See NORMANS.

VILKOMI'R, a town of West Russia, in the government of Kovno, on the Swenta, 130 miles south-east of Riga. It was a flourishing town in the 13th c., and continued prosperous till the 17th c., when it began to decline, in consequence of the wars with Sweden, Russia (V. being at that time a Polish town), and the Cossacks. The town contains an ancient church of the 13th century. Flax is exported to Riga; but the trade is not extensive. Pop. 7480.

VI'LLA, a term now applied to detached suburban residences with about one acre or less of ground attached to them. In the time of the Romans, the villa was a cluster of buildings in the country, forming a sort of private town, and containing in one the residences of the proprietor, farmer, and servants, and all the necessary offices and other accommodation for the cattle—the gardens, pleasure-grounds, &c. These villas were sometimes of enormous size, but they do not seem to have been built on any regular architectural plan, so as to produce an effect commensurate with their extent. The villa was divided into several parts, according to their uses: 1. The *Villa Urbana* was the portion in which the proprietor resided, and was laid out, as the name indicates, in a manner very similar to that of a town-house. The size and style of this part depended, of course, on the pleasure or quality of the master. It contained the eating-rooms, bed-chambers, baths, covered porticos, walks, and terraces. 2. The *Villa Rustica* was the portion set apart for the stabling, servants, &c., and the accommodation for the cattle. Its extent depended on the size of the farm and number of cattle. 3. The *Villa Fructuaria* was for the wine, oil, and other produce. The number of servants accommodated in a villa was very great. The livery-servants, along with the gardeners for the pleasure-grounds, comedians, musicians, &c., belonged to the Villa Urbana. The *Villicus* presided over the others, including the servants for tilling the land, the herdsmen, shepherds, goatherds, swineherds, poulterers, &c. There were also frequently several artisans, kept constantly on the premises, such as smiths, carpenters, &c.

VILLA or SANTA MARIA DEL PRINCIPE. See PUERTO PRINCIPE.

VILLAFRA'NCA, a small town of Northern Italy, in the province of Verona, and 9 miles south-west of the city of that name, on the left bank of the Tartaro. It was formerly a place of great strength; but it is now notable chiefly as the place where the treaty of peace between the emperors of France and Austria, which brought the Italian war of 1859 to a close, was signed June 11th of that year. Pop. (including the surrounding hamlets) 7500.

VILLAFRA'NCA DE PANA'DES (of the Bakers), a dull, backward town of Spain, in the province of Tarragona, in Cataluña, about 30 miles west-south-west of Barcelona. It contains some very early palaces of the kings of Aragon, not, however, of much interest. Pop. about 5500. V., founded

by Amilcar, was the earliest Carthaginian settlement in Cataluña.

VI'LLA-REA'L, a town of Valencia, Spain, in the province of Castellon, and 5 miles south of the city of that name, about 3 miles distant from the Mediterranean shore. It has wide, straight streets, laid out at right angles to one another, and contains flour and oil mills, woollen factories, and brandy distilleries. Pop. 7750.

VI'LLA RI'CA, a city of Brazil, capital of the province of Minas Geraes, called also Ouro Preto (q. v.).

VILLARS, Charles-Louis-Hector, Duc de, Marshal of France, one of the most illustrious of the great captains of Louis XIV.'s time, was born at Moulins, in the dep. of Allier, 8th May 1653. Being of a noble family, his education, with a view to the military profession, was prosecuted at the college of Juilly, and he subsequently volunteered into the army which was employed in Holland; and having attracted Louis XIV.'s attention by his daring courage and striking elegance of figure, obtained a troop of horse in 1672, served for two years under Turenne in Germany, and after the battle of Seneffe, received a regiment of cavalry, when yet in his 21st year. After a further term of service under Luxembourg and Crequi, he returned to Paris with the reputation of being one of the most promising young officers of the time. During the next ten years (1678—1688), he was employed in diplomatic service, chiefly at the court of Bavaria. In 1688, Louvois appointed him commissary-general of cavalry; and in the war which immediately followed the league of Augsburg, placed him at the head of the cavalry in Flanders. He was subsequently distinguished in the campaigns on the Rhine and in Italy. From 1699 till 1701, he represented France at the court of Vienna, and watched with sleepless vigilance the tortuous policy of the Austrian ministers, foiling by his penetration their most promising schemes, till he came to be regarded personally with extreme dislike, was shunned by all the court (Prince Eugene excepted), and even his life threatened. On his return, he was employed in Italy under Villeroi; and after a brief period of service under Catinat, was for the first time (1702) raised to independent command, when he was sent to succour the Elector of Bavaria, who had taken up arms on the side of France. Towards the close of 1702, V. crossed the Rhine, defeated the Markgraf of Baden at Friedlingen, took Treves, Traerbach, and Nancy; and early in the following year, again crossed the Rhine, traversed the almost impassable defiles of the Black Forest, and debouching from the mountains at Villingen, joined the Elector near Dutlingen, on the 12th of May. His bold and well-conceived scheme for carrying the war into the enemy's country, by advancing upon Vienna, while so many Austrian troops were employed on the middle Rhine, in Italy, and against Ragotski in Hungary, was foiled by the stupid obstinacy of his colleague, the Elector; and after his skill and genius had been tasked to the utmost to keep the Austro-Germans under the Markgraf of Baden and Stirum at bay, and he had been relieved by the return of his ally (who had been soundly beaten by the Tyrolese mountaineers), he reopened his line of communication westward, and leaving Marsin in command, returned in disgust to France. He was next commissioned to put down the insurrection of the Camisards (q. v.), which had been zealously fostered, for strategic reasons, by English and Dutch agents. V.'s manly moderation and soldierly frankness fairly won over Cavalier, the ablest of the insurgent leaders; and might, with his consummate military skill, have suppressed the insurrection. However he was not allowed to manage matters for himself, and all he could do was to reduce the ferment to insignificant proportions. V. was then sent to watch over the north-eastern frontier, and took post on the heights of Fronsberg, when Marlborough advanced upon him with 110,000 men; but V. had shewn such skill and strategy in the selection and fortification of his position, and such wise self-control in remaining strictly on the defensive, that the great English hero declined to risk an attack, and retreated; upon which V. burst into Alsace, captured the enemies' reserves of supplies and artillery, and advanced to Rastadt and Stuttgart. The withdrawal of some of his troops to reinforce the north French army forced him to recross the Rhine; yet, with his small army, he, in 1708, completely foiled all the attempts of Prince Eugene to penetrate into France. In 1709, he was sent to oppose Marlborough in the north; but unfortunately, at the commencement of the battle of Malplaquet (q. v.), he was severely wounded, carried off the field insensible, and rendered unfit for service till the following year; and the reopening of his wound in the autumn of 1710 forced him again to resign the command. But in 1711, he returned to his post, headed the last army France could raise, and with it fell upon the British and Dutch under Albemarle, who were intrenched at Denain (24th July 1712), carried their intrenchments sword in hand, and captured the most of them; he then turned upon Prince Eugene, and drove him under the walls of Brussels. This magnificent series of successes saved the national honour, and even life, of France, and brought about the peace of Rastadt (see Utrecht), which V. signed as plenipotentiary, 6th May 1714. After the peace he became, at court, the principal adviser on military affairs and on questions of foreign policy; was a strong opponent of Law's financial measures; but through the intrigues of Fleury, lost favour at court. The outbreak of war in 1732, however, brought out the old hero from his retirement, and with the title of 'Marshal-general of the Camps and Armies of France' he went to head the French army in the Milanese. The campaigns of 1733—1734 shewed that the weight of years had left V.'s military genius and spirit untouched; but the ill-behaviour of his ally, the king of Sardinia, determined him to solicit his recall; and he accordingly set out for France; but falling ill at Turin, he died there, 17th June 1734. V. was the last of the great military geniuses of the French monarchy, and was wholly free from the restless anxiety for *éclat* which detracts from the merits of so many of them. As a general, he possessed in a high degree rapidity of apprehension, skill in disposition, and promptitude (without precipitancy or rashness) in action. Humanity and sincerity, joined to thorough self-reliance, may be traced through the whole of his long and eventful life; and the two latter qualities occasionally exhibited themselves so prominently at court as to cause the 'professional courtiers' of Louis XIV. to look askance upon him as a 'rude and *immodest*' person. His Memoirs have been printed in Holland, and his Autobiography by Anquetil.

VILLA'RSIA, a genus of plants of the natural order *Gentianaceæ*, the species of which are widely distributed over the world, and are either aquatic or marsh plants, with entire leaves and yellow flowers. V. *nymphæoides* is a native of England, but rare. It is more common in many parts of Europe, from Denmark to the Mediterranean, and is very abundant in Holland, often covering large tracts of the canals with its beautiful flowers and

leaves. It abounds in the south of Siberia. It is easily cultivated.

VILLEFRANCHE, a town of France, in the dep. of Aveyron, is seated on the river of that name, in a valley surrounded by hills, 85 miles north-east of Toulouse by railway. It contains many interesting houses of the 15th and 16th centuries, and, in the market-place, a large collegiate church, in the pointed Gothic style of that period, and carries on important manufactures of copper wares, of gray cloths, and packing. Ironworks and foundries are in operation. Pop. about 15,000.

VILLEFRANCHE-SUR-SAÔNE, a small, industrious town of France, in the dep. of Rhone, stands on the Morgon, an affluent of the Saône, 18 miles north of Lyon, on the Paris and Marseille Railway. It is surrounded by a district studded with charming country-seats, and consists chiefly of a handsome street a mile and a quarter in length. Manufactures of cotton goods are carried on, and there is a great trade in wines, horses, cattle, hides, and cloth. Pop. about 12,000.

VILLEIN. See SERF.

VILLEMAIN, ABEL FRANÇOIS, a distinguished French scholar and writer, was born at Paris, June 11, 1790, and educated at the Lycée Impérial (now the Lycée Louis-le-Grand). In 1810, he was appointed Extraordinary Professor of Rhetoric at the Lycée Charlemagne; and shortly after, Maître de Conférences de Littérature Française et de Versification Latine, at the Ecole Normale. During the years 1812—1816, three of his literary essays were crowned by the French Academy—the *Eloge de Montaigne*, *Avantages et Inconvénients de la Critique*, and *Eloge de Montesquieu*. In 1816, he was appointed to a chair of Modern History at the Sorbonne, as assistant to Guizot; but in the course of the same year, was transferred by Royer-Collard to the chair of Eloquence, which he held till 1826. In 1819, he published, in 2 vols., his *Histoire de Cromwell d'après les Mémoires du Temps et les Recueils Parlementaires*—a work written in a calm, liberal, and wise spirit. Louis XVIII. took notice of the author, and V. was induced to enter on a political career. The post assigned to him was rather a delicate one, that of Chef de l'Imprimerie et de la Librairie. Under the ministry of M. Decazes, he also held the office of Maître des Requêtes to the Council of State, and in 1820 was decorated with the Legion of Honour. Two years later, appeared his translation (with preliminary essay and notes) of the *Republic* of Cicero; and in 1825, a drama entitled *Lascaris, ou les Grecs du XV. Siècle*, and an *Essai sur l'Etat des Grecs depuis la Conquête Musulmane.* In 1827, having gradually passed over to the ranks of the liberal opposition, he was charged, along with Lacretelle and Chateaubriand, to draw up the petition addressed by the French Academy to Charles X. against the re-establishment of the censorship of the press! The result of this hardihood was the loss of his appointment as Maître des Requêtes, and in consequence, a vast increase of his popularity as a lecturer at the Sorbonne. In the beginning of 1830, he was sent to the Chamber of Deputies by the electoral college of Evreux, took his seat among the liberal party, signed the famous address of the 221, and was altogether very prominent and active in those movements which brought about the constitutional monarchy of Louis Philippe. But he was too sober, unsympathetic, philosophical a politician, too much a *Doctrinaire* of the Guizot school, to be a favourite with the excitable masses, and he only sat in the Chamber for one year. In 1831, the king named him member of the Royal Council of Public Instruction, of which he became Vice-president in 1832. The same year witnessed his elevation to the peerage. V. held the portfolio of Public Instruction in the ministries of Soult (1839—1840) and Guizot (1840—1844); but his health failed under the immense labours of his department, and the impossibility of pleasing so many different parties—the Church, the University, the Reds, the Liberals, the Doctrinaires, and the king himself; and in consequence, he found it necessary to resign. Subsequently V. wisely devoted himself to literature alone. His principal works are: *Cours de Littérature Française, Tableau du XVIII. Siècle, Discours et Mélanges Littéraires* (1823), *Nouveaux Mélanges Historiques et Littéraires* (1827), *Etudes de Littérature Ancienne et Etrangère* (1846), *Tableau de l'Eloquence Chrétienne au IV. Siècle* (2d ed. 1849), *Etudes d'Histoire Moderne* (1846), *Souvenirs Contemporains d'Histoire et de Littérature* (1856), *Choix d'Etudes sur la Littérature Contemporaine* (1857), *La Tribune Contemporaine, M. de Chateaubriand* (1857), *Essais sur le Génie de Pindare et sur la Poésie Lyrique* (1859); besides a vast number of Essais, Etudes, Discours, Notices, and Rapports, addressed to the French Academy, of which he was perpetual Secretary from 1832 until his death. V. was one of the most accomplished writers of his time. He died in 1870.

VILLE'NA, a town of Spain, in the modern province of Alicante, and 37 miles north-west of the city of that name by railway. The streets are narrow and winding, and are overlooked by an old castle, which has an imposing appearance, owing chiefly to its elevated position. Around the town, the hills are clad with vines, and the country is fertile. A great fair, at which goods are sold to the value of £120,000, takes place here every autumn. Pop. 8224.

VILLENEUVE D'AGEN, or **VILLENEUVE-SUR-LOT**, a town of France, in the dep. of Lot-et-Garonne, in a charming valley, 15 miles north of the town of Agen. The river Lot divides it into two unequal parts, which communicate by a remarkably bold bridge of a single arch. The town, formerly called Gajac, was completely destroyed in the wars of the commencement of the 13th century. It was afterwards rebuilt, and then took its present name. A great trade is carried on in wines, prunes, cattle, and iron; there are manufactures of paper, cloth, table-linen, and copper-wares. Pop. 15,000.

VILLENEUVE, PIERRE-CHARLES-JEAN-BAPTISTE-SYLVESTRE DE, Vice-admiral of France, descended from an ancient and noble family, which has supplied an almost uninterrupted succession of distinguished ornaments to their country, was born at Valensoles, in the dep. of Basses-Alpes, December 31, 1763, entered the navy in his 15th year, and passed as captain in 1793. In 1796, he was raised to the rank of 'captain of division' (equivalent to *commodore* in the British navy), commanded the rear-division at the battle of the Nile, and after that disastrous fight, succeeded in carrying off to Malta his own vessel, the *Guillaume Tell*, and four others. In 1804, he was nominated vice-admiral; and in the following year, was appointed to the command of the Toulon squadron, with which he succeeded in reaching Cadiz, where he was joined by the Spanish fleet under Gravina. His orders being to attempt the withdrawal of the British fleet from the coasts of Europe, he bore away westwards across the Atlantic, reaching the Antilles on 14th May, and there making a number of valuable captures. A month afterwards, hearing that the British fleet had reached Barbadoes, he at once re-embarked his troops, and returned to Europe, pursued by Nelson. On

reaching the Azores, however, he encountered a British squadron, under Sir Robert Calder, and a fierce combat ensued, which lasted till dark. On the following morning, neither side cared to renew the engagement (for which V. was abused by *Le Moniteur*, and Admiral Calder was put on trial), and V., unable to reach Brest, again returned to Cadiz, where he was strictly blockaded by Nelson. The unjust severity with which he was treated by Napoleon arose from the fact, that the battle off the Azores, and the subsequent blockade of the French and Spanish fleet in Cadiz, had completely ruined Napoleon's scheme for the invasion of England; and the further indignity of being superseded, hurried the unfortunate V. into the desperate resolve of engaging Nelson before his successor could arrive at Cadiz. Besides, by a stratagem of Nelson, he was led to believe that the strength of his enemy was such as to afford him a favourable opportunity of wiping out the disgrace of his former failures, and he accordingly, in superior force, sallied out of the harbour, and engaged in the memorable conflict of Trafalgar (see TRAFALGAR, and NELSON). A passage in the instructions issued to his captains on October 20, sufficiently shews the irritated state of his feelings—'Every captain who is not under fire is not at his post, and a signal of recall will be a brand of dishonour to him.' V., whose vessel, the *Bucentaure*, was completely dismasted, was forced to strike his flag, and was made prisoner, and conveyed to England, whence he returned to France in April 1806. Instead of rendering himself at Paris, he stopped at Rennes, with the view of ascertaining the kind of reception he was likely to meet with from the emperor. The result of his inquiries was unfavourable; and on the morning of April 22, he was found dead in bed, with six knife-wounds in his heart. He had died by his own hand.

VI'LNO (often written VILNA), a government of West Russia, bounded on the W. by Poland, from which it is separated by the Niemen; and on the E. by the government of Vitebsk, from which it is separated by the Western Dwina, and by that of Minsk. Area, 16,320 sq. m.; pop. 899,993, mostly Lithuanians, Slavonians, Jews, and Tartars. Only 18 per cent. of the whole pop. are Poles. The rivers are the Vilia, Beresina, affluents of the Niemen, and the Disna, which flows north into the Dwina. The surface is flat; the highest part being only 1100 feet above sea-level. The soil, in some places very fertile, consists for the most part of clay and sand. Marshes abound, and there are 400 small lakes. The woods which cover the marshes are the great source of the wealth of the government. The principal trees are fir and pine, and the timber is floated down the Niemen and Dwina for export, and used in the interior for shipbuilding, &c. The climate is mild. There are a good many manufactories in the government; but agriculture is the principal occupation of the inhabitants, and fairs are numerous and important.

VILNO, an important city of West Russia, capital of the province of the same name, picturesquely situated on the Vilia, 473 miles south-west of St Petersburg. Besides its cathedral, it is remarkable for the number of its religious edifices, among which are a mosque, several synagogues, and Lutheran meeting-houses. It formerly contained a university, founded in 1576, but abolished in 1832. Among existing institutions, the chief are the observatory, medical society, museum of antiquities, and theatre. The principal articles of trade are timber and corn. Manufactures are not important. Pop. (1867) 79,265.

In 1323, Gedimin, Grand Duke of Lithuania, transferred his capital from Troki to Vilno. In 1795, after the final annexation of Lithuania to Russia, V. was made the chief town of the government of the same name.

VINAGO, a genus of *Columbidæ*, the most marked section of that family, having a comparatively stout solid bill, laterally compressed; with a hard, hooked, and inflated tip; the tarsi short, the feet large, and formed for perching or grasping. The species, of which not many are known, are natives of the tropical parts of Asia and Africa. They inhabit forests, and are shy and timid birds.

VI'NCA. See PERIWINKLE.

VINCENNES, a commune and market-town of France, in the dep. of Seine, five miles east-south-east of the Louvre in Paris. In reality, the town is merely a great fortress and barracks, and is famous for its arsenal, and for its school for the practice of shooting. At the latter, the Chasseurs de Vincennes, and all the best marksmen of the army, are trained. Pop. (of commune) 17,064.

V. owes its historical importance to its castle and park. The château, the main object of interest in the town, is rectangular in shape, and dates from the middle of the 14th century. It was surrounded by nine towers, which were in existence down to the year 1808, but of which only one, known as the Donjon de Vincennes, 170 feet high, and with walls 17 feet thick, remains. The original building dates from the reign of Louis VII., and had its origin in a hunting-lodge, erected here by that sovereign in 1137. Philippe-Auguste enlarged it, and stocked its woods with wild animals, sent to him by the king of England. Here Queen Jeanne (wife of Philippe le Bel), Louis le Hutin, and Charles le Bel, ended their days. Philippe de Valois caused the old mansion to be demolished, and laid the foundations of the more modern château, which, from the middle of the 14th c. till the time of Louis XV., was a royal residence, and the birthplace and place of death of many princely personages. After this time, it was used as a prison, and among the famous men who have languished within its donjon, may be mentioned Henry IV., the Prince of Condé, Cardinal de Retz, Mirabeau—who here wrote his translation of Tibullus—and the Duc d'Enghien, who was shot in the moat of the castle by order of Bonaparte. There are extensive barracks, known as the New Fort, built 1848—1852, and a Salle d'Armes, with a large collection of all sorts of weapons. In the centre of the Bois de Vincennes, a large tract has been cleared as an exercise-ground for troops, and for rifle and artillery practice. Other parts of the Bois, which presents much fine scenery, have been embellished with artificial sheets of water, rivulets, and agreeable walks.

VINCENNES, a city of Indiana, U. S., America, on the left bank of the river Wabash, on the Ohio and Mississippi, and Evansville and Crawfordsville Railways, 110 miles south-west of Indianapolis. It is the entrepôt of a rich agricultural country, has a well-endowed university, Roman Catholic bishopric, seminary, and academy, two semi-weekly and three weekly newspapers, and considerable manufactures. A French trading-post was established here in 1710, and a colony in 1735, which lived peacefully with the Indians. Until 1813, it was the capital of the North-west Territory. Pop. (1870) 5440; (1880) 7680.

VI'NCENT, ST, a British island of the West Indies, belongs to the Windward Group, and lies about 28 miles south of St Lucia, and 100 miles west of Barbadoes. Lat. 13° 10′ N., long. 61° 5′ W. It is 18¼ miles long, 11 miles broad, has an area of 131 sq. m., and contained (in 1871) 35,688 inhabitants, of whom a few were white, about one-fifth

coloured, and the rest black. A chain of bold and high mountains traverses the island from north to south, and throws out lateral branches, between which are ravines, which widen into open valleys as they approach the seashore. Evidences of volcanic action are everywhere visible on the island—strata are upheaved and disturbed, and huge masses of rock have been displaced. In the interior is a volcanic mountain, 3000 feet high, and the crater of which is half a mile in diameter. The climate is hot, the temperature ranging from 75° to 87°. The annual rainfall is about 76 inches. No valuable minerals have as yet been discovered. The chief products are sugar, arrowroot, rum, cotton, and molasses; and the value of the exports for 1868 was £195,551—that of the imports, chiefly linen, cotton, and woollen manufactures, manures, flour and wheat, fish dried or salted, pork salted or cured, hardware and cutlery, leather and leather manufactures, timber, butter, and mules, £71,396. Near 700 vessels, of about 35,000 tons, enter and clear the ports of St V. annually. Religion and morality are at a low ebb—more than half the children are reported as illegitimate. There are about 30 schools, attended by 2000 or more children. The revenue, derived chiefly from export duties, was (in 1868) £25,204; the expenditure, £21,727, of which £1216 was employed in the repair, &c. of roads. The government consists of a lieutenant-governor, a legislative council, and 12 elective members of Assembly. The capital is Kingston (q. v.), and the other one or two small towns or villages are of little note. In 1861, the importation of coolies from India was commenced, 500 of them having been brought to the island in that year. Shocks of earthquake are frequent; hurricanes occur at intervals, and the violent rains occasionally damage the crops and roads.

VINCE'NTIAN CONGREGATION, so called from its founder, the Roman Catholic saint, Vincent de Paul, is an association of secular priests, who, although not in the strict sense a religious order, are bound by vows, and are especially devoted to the duty of preaching and hearing confessions among the people, particularly the poor. Another object of the V. C. is to undertake the direction of episcopal seminaries and other colleges for the education of ecclesiastics, as also to direct the annual devotional exercises of the secular clergy, called Ecclesiastical Retreat. See Paul, Vincent de. At the latest recorded enumeration which has come under our notice, the Congregation numbered above 700 members, in France, Italy, Poland, the Levant, and Algeria. The members are numerous also in America, and branches exist in Ireland and Scotland. The name Vincentian is sometimes given also to the Sisterhoods (of which there are several, and of which that of Charity is the most remarkable), which were founded by Vincent de Paul, and even to the Charitable Lay Association, better known as the Society of St Vincent de Paul, which has extensive ramifications in almost all the countries in communion with the church of Rome, and which has been the occasion of certain recent restrictive measures in France. See Brothers and Sisters of Charity; Paul, Vincent de.

VI'NDHYA MOUNTAINS. See India.

VINE, a term sometimes used to designate any climbing plant, especially if shrubby, but also more particularly applied to the species of the genus *Vitis*, of the natural order *Vitaceæ*. This genus has *pentamerous* flowers (5-toothed calyx, 5 petals, 5 stamens), and has the petals united into a kind of hood and deciduous. The most important species is the Grape Vine (*V. vinifera*), from the fruit of which wine and raisins are made. The name grape is from the French *grappe*, a bunch of grapes, from the same root as *gripe* or *grab*, to grasp.

The grape vine has large, angular, lobed, toothed, and more or less hairy leaves. The stems are numerous and branching, very long, and of rapid growth, with many tumid joints, the outer bark readily splitting and peeling off, the woody tissue abounding with vessels of large size, from which, at the seasons of active vegetation, if the branch is

Vine (*Vitis vinifera*), shewing the flowers and their parts, the leaves, and the fruit.

wounded or cut across, the sap pours in prodigious quantity. The fruit-stalks, which are much branched, are opposite to the upper leaves, or in their stead are tendrils. The flowers are small, greenish white, and fragrant. The fruit is a round or oval berry, 2-celled and 4-seeded, varying much in size and colour—in the small Corinth or Currant Grape, about ¼th of an inch in diameter; in the largest varieties, more than half an inch; green, yellow, red, purple, and sometimes variegated; but the colour is entirely in the outer skin, the juice being always colourless; and whilst the pulp of the grape is wholesome, nutritious, and gently laxative, the skin is astringent and indigestible. Some of the ovules are often abortive, or even all of them in the fruit of old vines of some varieties, as in the seedless Ascalon or Sultana raisins.

The vine attains a large size, the stem being sometimes 18 inches in diameter, so that the wood, which is very hard and durable, has been employed for making furniture, statues, &c. It attains also a very great age, continuing fruitful for at least three or four hundred years.

The grape is one of the most valuable of fruits, not only because of its use in the manufacture of wine, and as the source also from which brandy, vinegar, and tartaric acid are obtained, but because, both in a fresh and dried state, it forms not a mere article of luxury, but a great part of the food of the inhabitants of some countries. Dried grapes, under the names of *raisins* and *currants*, are a considerable article of commerce. Fresh grapes are commonly eaten with bread in Syria, and some other countries in which they abound. The usefulness of the grape is increased by its keeping fresh for many weeks in a cool airy place. Some varieties are more easily kept than others. More than 1500 varieties are described in works on the culture of the grape; and this subject, under the name *Ampelography* (Gr. *ampelos*, a vine), has been

elevated by some recent German writers almost to the rank of a distinct branch of science. The quality of the grape is extremely liable to be affected by circumstances of soil and climate, and this is particularly to be observed in the wine produced from it, the difference between the produce of two vineyards in the same neighbourhood being often very remarkable.

The vine dislikes a damp soil, but will thrive in almost any open soil with good drainage. In rich deep soils, it grows luxuriantly, and produces abundance of large fruit; but on shallow, dry soils, the fruit, though less abundant, is of finer flavour. The vineyards most celebrated for the excellence of their wines are not generally of rich soil. The steep slopes of hills are often planted with the vine, and are sometimes terraced for this purpose; and nothing can be more suitable to situations where patches of good soil are mingled with bare rocks, nor anything more beautiful than the rocks covered with luxuriant foliage and rich fruit. This mode of cultivation on steep rocky slopes was anciently very prevalent in Judæa.

It is doubted of what country the grape-vine is a native, nor is it known at what time, certainly very remote, its cultivation was first introduced into the south of Europe. It is now found wild in some parts of Europe, but is rather naturalised than truly native. It seems probable that it is indigenous in the hilly countries on the south of the Caspian Sea, where it is very abundant and luxuriant, climbing to the tops of the loftiest trees, and producing large bunches of delicious fruit. But it is doubted if *Vitis Indica*, a native of the north of India, abounding in some parts of the Himalaya, is really a different species. The wild grapes of these mountains are round and purple, and very agreeable. It is doubted also by some if any of the wild grapes of America are really distinct; some of which, however, are much more different in their characters and qualities from the common form of the cultivated plant. Of these American grapes, the FOX GRAPE (*V. Labrusca*) is the most similar to the cultivated grape. It is common throughout great part of Eastern North America, and is found as far north as Quebec. The berries are large, deep blue, varying to red and white, with thick skin and tough pulp, and have been found capable of much improvement by cultivation. The CHICKEN GRAPE (*V. æstivalis*), not found north of lat 42°, has smaller and more agreeable berries. The *V. cordifolia*, a frost grape, ripening after frosts.—The BULLACE GRAPE (*V. rotundifolia*), found only as far north as lat. 39°, has larger grapes than any other American species, and of agreeable flavour.—There is also a species of a very foxy aroma (*V. vulpina*), the MUSCADINE or SOUTHERN FOX GRAPE, from which Prof. Gray derives the *Catawba* and *Scuppernong* varieties. But the habit and leaves of all these differ very little from those of the common vine. From the several species, the numerous excellent varieties in cultivation have been derived. A variety known as *V. riparia*, often found on gravelly banks of rivers, has exquisitely fragrant flowers. The WATER WITHE of Jamaica, so called from the great quantity of sap which its shoots pour out when cut (*V. Caribbæa*), does not differ in very marked botanical characters; although its small black berries, which it produces in immense quantity, are acid and austere.

The cultivation of the grape and the making of wine are of the most remote antiquity, as appears from the Scripture history of Noah, and from many passages of the most ancient authors. The mythological fable of the marches of Bacchus relates to the extension of the culture of the vine from Asia into Europe. The earliest accounts we have of the manner of cultivating the vine are by the Roman authors Virgil and Columella. The vine was probably introduced into the south of France as early as into Italy; it is said to have been brought to Marseille by the Phocæans, about 600 B.C., and its cultivation was early co-extensive with civilisation in all the countries near the Mediterranean. In Italy, so much of the land was occupied by vineyards, that the Emperor Domitian, fearing a scarcity of corn, issued a restrictive or prohibitory edict, 81 A.D., which was afterwards long continued in force, through fear that the abundance of fine wine might tempt the barbarians of the north to invade the country. The vine was introduced into the south of Germany about the 3d C. B.C. Augustus preferred the Rhætian wine to all other. The first vineyards on the Rhine and Moselle were planted by the Emperor Probus in 281 A.D Under the Merovingians, the culture of the vine extended greatly both in France and Germany. Charlemagne derived a very considerable revenue from the vineyards even of the northern parts of his empire. The Huns who remained in a number of settlements on the Rhine after the expedition of Attila into Gaul, 451 A.D., brought thither the arts of cultivating the grape and of making wine from Pannonia; and Hunnish grapes and Hunnish wine were long in particular repute. In the middle ages, the monks were the first to plant vineyards and to make wine in many parts of Europe.

The cultivation of the vine was introduced into England by the Romans. At the time of the Norman Conquest, there seem to have been vineyards in the south and south-west of England, and although they afterwards disappeared, successful attempts were occasionally made to re-establish them; and one at Arundel Castle in Sussex yielded, about the middle of last century, large quantities of wine. Of late years, the cultivation of the vine has much increased in the south of England, in gardens, on the walls of suburban villas and of cottages, but chiefly for the sake of the fresh fruit, although wine of pretty good quality is also made in small quantities for domestic use.

The vine does not, in ordinary seasons, ripen its fruit well in Great Britain further north than Yorkshire, although grapes have occasionally ripened in the open air in Scotland. It is, however, a hardy plant, in so far as the endurance of severe winter-frosts is concerned; but it requires for the ripening of its wood, as well as of its fruit, a considerable summer-heat continued for several months. Thus, it does not succeed in parts of Britain in which the mean temperature of the year is higher than that of countries where good wine is made. A very moist climate is also unsuitable to it; and therefore it is not extensively cultivated in the north-west of France, although there are many productive vineyards in the north-east. In the most northern regions to which its cultivation extends, the vine is protected in various ways during winter; in some places, by laying down its branches, and covering them with some depth of earth. It produces abundant fruit in warm climates, such as India, but the juice passes too rapidly into acetous fermentation to be used for making wine, although in many of the mountainous districts of India it might probably be cultivated for this purpose with success. Shiraz, in Persia, is one of the warmest climates celebrated for the production of good wine.

In Europe, the cultivation of the vine forms an important branch of rural economy as far north as Coblenz on the Rhine; but in some countries, particularly in Greece and the Ionian Islands, raisins form the chief part of the produce of the vineyards.

The cultivation of the vine was early introduced by the Spanish and Portuguese into the Azores, the Madeira and Canary Isles, and America. The first vines were carried to the Cape of Good Hope by the Dutch in 1650; but whilst the wines of Madeira and those of the limited district of Constantia at the Cape of Good Hope have long enjoyed a high celebrity, and those of Canary and Teneriffe have been imported in considerable quantities into Europe. The cultivation of American varieties of the vine is now prosecuted with success on a large scale in certain districts whose atmospheric conditions are favourable, especially near the great lakes, in Ohio and Michigan, and wines are now produced rivalling many of the finer European kinds. The foreign vine has long been grown in California, where its cultivation has recently attained vast dimensions, while its product is scarcely excelled in quality.

The cultivation of the vine varies much in different countries. Success seems chiefly to depend on a good sunny exposure, liberal but not coarse manuring, and constant attention. New varieties are raised from seed, but the ordinary modes of propagation are by layers and cuttings. Fine varieties are sometimes budded or grafted on less valuable ones. In the vineries of Britain, the vines are carefully trained, in various ways, so as most completely to cover the walls and trellises, and to turn the whole available space to the utmost account; whilst superfluous shoots are displaced by pruning, so that the strength of the plant may be directed to the fruit-bearing branches, and that there may be no undue luxuriance of foliage to prevent sufficient access of light and air. The luxuriant growth of the plant renders the frequent application of the pruning-knife necessary during summer. The fruit being produced on shoots of the current year, the pruning is managed with a view to the abundance of these shoots, the greater part of which, when they have served their purpose, are cut away, such only being left as are required for the extension of the space profitably occupied by the plant. The bunches of grapes are also generally thinned out with great care, in order that finer fruit may be produced. By such means, and the aid of artificial heat, grapes are produced equal to those of the most favoured climates, and the vine attains to a large size and a great age. The famous vine at Hampton Court has a stem more than a foot in circumference, one branch measuring 114 feet in length, and has produced in one season 2200 bunches of grapes, weighing on an average one pound each, or in all nearly a ton.

In the warmer countries in which the vine is cultivated, as in Italy, it is generally allowed to grow very freely, attaching itself to trees or espaliers; but in more northern regions, it is commonly much pruned down, so that, instead of luxuriance and beauty, the vineyards exhibit a stiff and formal regularity. In some places, the vines are attached to poles; in others, they are pruned so close and kept so low as merely to form bushes which require no support. This mode of cultivation is sometimes adopted also in comparatively warm climates, as in some of the vineyards of the south of France, and in those of Constantia, at the Cape of Good Hope.

Only a few of the varieties of grape cultivated in Britain are at all suitable for the open air. By a judicious selection of varieties, as well as by variously regulating the application of heat, the grape season in vineries is greatly prolonged.

Grapes are sent to market in Britain in large quantities from the numerous vineries; they are also imported from Portugal, Spain, France, and Holland, generally packed in sawdust, but the close packing and the sawdust are injurious to their flavour.

The *vine disease*, or *vine mildew* (*Oidium Tuckeri*), has of late years made great ravages both in the vineries of Britain and in the vineyards of many countries. See OIDIUM, in SUPPLEMENT.

The juice of ripe grapes contains a considerable quantity of *grape-sugar* (see SUGAR), small quantities of a glutinous substance, and of extractive, bitartrate of potash, tartrate of lime, a little malic acid, and other ingredients, suspended or dissolved in water. The rapidity with which it passes into a state of fermentation after being expressed from the fruit, is remarkable.

For the making of wine, the wine-trade, the qualities and uses of wine, the different kinds of wine, &c., see WINE. Concerning the other commercial products of the grape, see BRANDY, VINEGAR, TARTARIC ACID, RAISINS, and CURRANTS.

VINEGAR is that form of ACETIC ACID (q. v.) which is generally preferred for culinary purposes, and which is made by the fermentation of vegetable substances. In Great Britain, it is manufactured on a large scale by the fermentation of malt; on the continent of Europe, it is as largely made from low wines which have turned sour. Malt, or British vinegar, as it is sometimes called, is made by brewing a weak wort from malt exactly as for Beer (q. v.). To 100 gallons of this, at a temperature of 70°, are added 4 gallons of yeast, and well stirred through for 8 or 10 minutes. This mixture is then allowed to ferment actively for two days, and is then transferred to the stoving-room; here it is distributed into a number of tubs, which, when filled, are covered over with coarse canvas. This room is dark, and is heated by stoves, and the heat is constantly sustained for weeks until the conversion of the wort into vinegar is complete. Other processes are used by different manufacturers for the purpose of producing it quicker; but the minute descriptions necessary to render them clear would be out of place here. Much vinegar is also made of beer which has become sour; it is, however, very inferior in quality, and wants the agreeable flavour of malt vinegar prepared by the above process, which is due to the presence of acetic and other ethers.

The greatest manufacture of *wine vinegar* in Europe is at Orleans, in France. Here the wines are sent from all parts when unfit for drinking, and are converted into vinegar. In the manufacture, a large number of casks are used, with

Section of Cask of Vinegar.

openings into each of only two inches diameter. Into each one are poured 100 pints of vinegar boiling hot; and to this, after eight days, are added 10 pints

of sour wine, and this is repeated every 8 days until the cask is full; another 15 days completes the process, and the vinegar is ready for use. Beech-shavings are much used in vinegar-making, as they are found to assist in clarifying the liquor by attracting the lees, which settle upon them, and leave the liquor clear, in which state it acetifies more rapidly.

'According to Ure, a good vinegar may be prepared by adding to each gallon of a syrup composed of 1¼ lb. of sugar and 1 gallon of water, a quarter of a pint of yeast. If kept for three days at a temperature of 75° or 80°, it will be sufficiently acidified to allow of being drawn off into the refining-cask, where one ounce of bruised raisins and one ounce of crude tartar are to be added to each gallon of liquor. When the sweet taste has quite disappeared, it should be drawn off into bottles, and corked down tightly. It is stated that such vinegar will contain 5 per cent. of pure acetic acid.'—Miller's *Organic Chemistry*, 2d ed. p. 339. Vinegar prepared by these methods contains a large amount of foreign matters, which can be got rid of by simple distillation; the acid liquid which comes over constituting what is known in pharmacy as *distilled vinegar*. What is sold commercially as distilled vinegar is simply acetic acid distilled from wood (see PYROLIGNEOUS ACID), and diluted with five times its volume of water. This constitutes also the vinegar used by pickle-manufacturers; it is quite as wholesome as common vinegar, but wants its agreeable flavour; its preservative powers are, however, much greater, and its price very much less, if fairly charged. Vinegar containing 5 per cent. of the pure acid is the strongest that is ever produced, and is termed *proof vinegar*. There are four kinds manufactured, which are known in trade by the numbers 18, 20, 22, and 24, the last being the best quality. The strength of any specimen is best ascertained by determining the quantity of anhydrous carbonate of soda which a given weight of it will neutralise, it being recollected that 100 grains of carbonate of soda correspond to 96·2 grains of anhydrous acid. The ammonia test, according to Neligan, serves to distinguish French from English vinegar: with the former, the colour is purplish; with the latter, there is either no change, or it is brownish. There is generally a slight turbidity, which is due to a trace of lime.

As a condiment, vinegar is an ingredient of a large number of sauces, and of all ketchups and pickles; and although it cannot be regarded as an essential article of food, its applications in cookery are numberless. Young ladies, with an undue tendency to corpulency, sometimes drink vinegar freely with the view of improving the figure; but as vinegar only causes thinness by injuring the digestion, it is obviously not worth while that they should run the risk of exchanging slight fulness of habit for chronic dyspepsia.

Vinegar is used in medicine as a cooling astringent, and may be employed with much benefit if taken freely, when largely diluted with water, in hæmoptysis, in hæmatemesis, and in the colliquative sweating of hectic fever. Dr Neligan states that in severe hiccough, he has often seen benefit derived from a dose of a wine-glassful of vinegar. In cases of poisoning with the alkalies or their carbonates, it is one of the best antidotes. It may also be employed locally in various ways—as, for example, to check hæmorrhage from the nose, womb, &c. In intestinal hæmorrhage, an enema containing vinegar and cold water may be used with success, especially if the lower part of the intestine be the seat of the bleeding. Sponged in a diluted state (one part to three of cold or tepid water) over the neck, chest, &c., it affords great comfort and considerable relief in cases of colliquative sweating. In its character of a refrigerant rather than as an astringent, its local action on the skin is attended with much benefit in the treatment of most febrile and inflammatory diseases; it should be freely applied, as in colliquative sweats, to the surface of the body, face, and extremities; and thus employed, has a very tranquilising effect, and often induces sleep. The heat and pain commonly experienced in sprains are often relieved by the local application of brown paper soaked in diluted vinegar, and changed when the feeling of heat returns. It is an important addition to astringent gargles in cases of relaxed uvula and tonsils; and is the best application to the eyes in cases in which lime has got within the eyelids. The ordinary dose is from 2 to 4 drachms; and when taken as a drink, 3 ounces may be mixed with a pint and a half of water, and taken in the course of the day.

The term *Chili vinegar* is applied to a preparation obtained by infusing half an ounce of cayenne pepper in a quart of French vinegar for ten days, and straining. It is commonly added to gargles in the proportion of 1 ounce to 8 or 9 ounces of infusion of roses, in cases of relaxed sore throat.

Aromatic Vinegar, known also as *Vinegar of the Four Thieves*, *Marseille Vinegar*, and *Camphorated Acetic Acid*, consists of strong acetic acid, holding in solution camphor and the oils of cloves, lavender, rosemary, and lemons. It is very fragrant and volatile, and must be kept in well-stoppered bottles. It was formerly regarded as a valuable prophylactic of all infectious diseases, but is now only used as an external stimulant, the vapour being applied by a smelling-bottle to the nostrils in cases of fainting.

VINEGAR-PLANT (*Penicillium glaucum*), a fungus of the sub-order *Hyphomycetes*, but somewhat resembling those known by the name of MOULD (q. v.) It forms a flocculent mass or web, which is tough and crust-like or leathery, and when examined by the microscope, is seen to consist of a *mycelium* of branched threads, with the branches somewhat tangled, and the spores disposed in patches about the pencil-shaped ends of fertile threads. It is found on decaying bodies and in fluids undergoing the acetous fermentation, which it greatly promotes, and which, indeed, it very readily occasions, a small piece placed in sugar and water soon changing it into vinegar. Advantage is sometimes taken of this property for making vinegar.

VINET, ALEXANDRE-RODOLPHE, Swiss divine and author, was born at Lausanne, June 17, 1797, and received his education in his native city as a student of the Protestant Church, of which he was ordained a minister in 1819. From an early age, he shewed a passionate fondness for the study of French literature, which he cultivated with so much success, that at the age of 20 he was appointed Professor of French language and literature in the gymnasium of Basel. This position he held till 1837, when he removed to Lausanne, to fill the chair of Practical Theology in the Academy of that city, which chair, however, he resigned in 1840, when he seceded from the national church, on account of the new constitution imposed upon it in that year. Notwithstanding his resignation, he appears to have continued his lectures either in the Academy or privately; and in 1844 again connected himself with that institution as Substitute-professor of French Literature. V. took a leading part in the formation of a constitution for the Free Church of Vaud, formed by those who seceded from the national church in 1845, this secession having been in a great measure the result of the influence of his own writings and teachings in

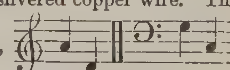
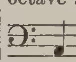
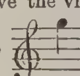
favour of the separation of church and state. He died 18th May 1847. V. was an eloquent and earnest preacher, clear and brilliant, rather than profound in thought; and although highly evangelical and orthodox, advocated the utmost liberty and toleration of opinion and practice in matters of religion. He wrote largely both on literature and religion, and most of his works have been translated into English. His works on French literature shew that he was thoroughly acquainted with its history, and possessed the critical faculty in no mean degree; as a philosophico-religious writer, he is very popular among the educated religious public both in England and America. His principal works are: *Chrestomathie Française* (3 vols. 1829); *Histoire de la Littérature Française au XVIII. Siècle; Etudes sur la Littérature Française du XIX. Siècle*, 3 vols.; *Mémoire en Faveur de la Liberté des Cultes* (1826); *Discours sur quelques Sujets Religieux* (1831), and *Nouveaux Discours*, &c. (1841)—from which two last-mentioned works selections have been translated into English, and published under the title of *Vital Christianity; Etudes sur Blaise Pascal, Etudes Evangéliques*, and *Nouvelles Etudes Evangéliques*, which have been rendered into English as *Gospel Studies*, &c.

VI′NIC ACIDS, an important group of acids, whose mode of formation may be thus described. When a mixture of concentrated sulphuric acid with any of the alcohols is heated to about 212°, chemical action takes place, and the result is the formation of a new coupled or conjugated acid, in which the elements of one molecule of the alcohol radical and one of sulphuric acid, H_2SO_4, are present. In these compounds, the existence of sulphuric acid can no longer be detected by the addition of baryta; the new acids forming soluble baryta-salts. As examples of these acids may be mentioned sulphomethylic or methyl-sulphuric acid, $(CH_3)HSO_4$, and sulpho-ethylic or ethyl-sulphuric acid, $(C_2H_5)HSO_4$, which has been already described under its old name of *Sulphovinic Acid.*

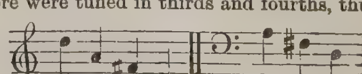
VI′NLAND—i.e., WINELAND—the name given to the chief settlement of the early Norwegians in North America. It is undoubtedly represented in modern times by part of Massachusetts and Rhode Island. The first that saw it was Bjarne Herjulfson, who was driven thither by a storm in the summer of 986 A.D., when making a voyage from Iceland to Greenland, of which country, his father, Herjulf and Eric the Red, were the earliest colonists. But Bjarne did not touch the land, which was first visited by Leif the Lucky, a son of Eric the Red, about 1000 A.D. The latter built a number of wooden houses, which were called *Leifsbúdir* (Leif's bothies?). A German of the name of Tyrker, who accompanied him, noticed the grape growing there, as in his native country, and hence Leif called the region 'Vinland.' Two years after, Leif's brother, Thorwald, arrived, and in the summer of 1003, led an expedition along the coast of New England, southwards, but was killed the year following in an encounter with the natives. The most famous of the Norwegian explorers, however, was Thorfinn Karlsefne, an Icelander, who had married Gudrid, widow of Thorstein, a son of Eric the Red, and who in 1007 sailed from Greenland to V. with a crew of 160 men, where he remained for three years, and then returned, after which no further attempts at colonisation were made. Rafn (q.v.), in his *Antiquitates Americanæ*, has published the most complete collection of the evidence which proves the pre-Columbian colonisation of America. See Wilhelmi's *Island, Hvitramannaland, Grönland und Vinland* (Heidelberg, 1842). Both Rafn and Finn Magnusen are excessively anxious to shew that Columbus derived his first hints of a new world from the accounts of these old Icelandic expeditions. Their *amor patriæ* perhaps leads them too far, but, on the other hand, it is well to bear in mind that Finn Magnusen, in one of the early numbers of the *Nordisk Tidsskrift for Oldkyndighed*, has conclusively established the fact that Columbus did visit Iceland in 1477, 15 years before he undertook his great expedition across the Atlantic; and it is not at all improbable that he may have heard, while there, something of the long-abandoned Vinland, and so had his adventurous thoughts first turned in that direction.

VINNI′TZA, a town of West Russia, in the province of Podolia, stands on both banks of the Bug, 100 miles east-north-east of Kaminetz. It was founded in the 14th c., and has suffered much from the invasions of Tartars and Cossacks. There are very few factories, and the trade, which is not extensive, is carried on exclusively by the Jews. Pop. 11,055.

VIOL (Mid. Lat. *vitula;* Ital. *viola*, derivation uncertain), a musical instrument played with a bow, no longer in use, which was the immediate precursor of the violin. It is to be seen represented on monuments as far back as the close of the 11th century. The belly and back were flat; there were larger bends in the sides than in the violin; and frets, like those of the guitar, were placed on the neck of the instrument, to shew where the fingers of the left hand should be put to produce the desired notes. There was great variety in the number of strings: in Germany, three, four, and five were all common; in Italy, there were usually six. The strings were tuned by fourths and thirds. There were four sizes of viol in use for treble, alto, tenor, and bass respectively, and they were often played together in concerted music. The smaller viols were called *viol da braccio*, from being held with the arm; the larger, *viol da gamba*, from being placed between the legs. The treble viol was rather larger than the modern violin. The viol da gamba, or bass viol, held its place longer than the smaller viols, but was eventually superseded by the violoncello.

VIO′LA, ALTO VIOLA, or TENOR VIOLIN, a larger description of violin, to which the part between the second violin and bass is generally assigned. It has four gut strings, the two lower covered with silvered copper wire. They are tuned by fifths, thus, , exactly an octave above the violoncello. The compass is from  to , or higher, and the music is generally written on the alto clef.

VIO′LA D'AMO′RÉ, an obsolete instrument of the viol tribe, revived a few years ago with some success by M. Urhan at Paris. It had five or seven strings of catgut, which were placed and played as in other bow-instruments; but below them, and passing underneath the bridge, were five or seven other strings of metal tuned in unison with them, which vibrated sympathetically when the former were played; giving to the music a mysterious resonant character. The compass was at least three octaves and a half. The strings of M. Urhan's viola d'amore were tuned in thirds and fourths, thus:



VIOLA′CEÆ, a natural order of exogenous

plants, of which about 300 species are known, natives both of temperate and tropical countries, those belonging to the former being generally herbaceous, and those belonging to the latter generally shrubby. They have simple leaves with persistent stipules. The calyx consists of five persistent sepals, usually elongated at the base; the corolla of five hypogynous petals, unequal in the sub-order *Violeæ*, and equal in the sub-order *Alsodeæ*. There are five stamens inserted in a hypogynous disc; the filaments prolonged beyond the anthers. The ovary is one-celled, generally with many ovules, the style single, with an oblique stigma. The fruit is a three-valved capsule, with many seeds. The best known species are the Violets (q. v.), noted for their beauty and fragrance. Emetic and purgative properties prevail in the order, and some of the South American species, particularly of the genus *Ionidium*, yield valuable medicines. See IPECACUANHA and CUICHUNCHULLI. Yet the leaves of the Lobolobo (*Conohoria* or *Alsodeia lobolobo*) are used in Brazil as spinach.

VIOLENT PROFITS, in the Law of Scotland, mean the income or rent enjoyed by one who forcibly or unwarrantably detains land to which he has no title. Such profits are held to be the full profits which the landlord could have made either by possessing the lands himself or by letting them.

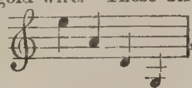
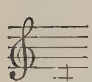
VI'OLET (*Viŏla*), a genus of herbaceous plants, mostly perennial, of the natural order *Violaceæ*. They have a short stem, or are stemless, having in the latter case a short root-stock (rhizome); the leaves are alternate, and have long stalks; the flowers have five petals, different in form and size, the lowest having a spur behind. Nearly 200 species have been described, natives chiefly of northern temperate countries. Several species are much cultivated in gardens, some, as *V. tricolor*, on account of their beautiful flowers; others, as *V. odorata*, on account of their fragrance. *V. tricolor*, the PANSY, PANSY V., or HEART'S EASE, is very

1, Hairy Violet (*Viŏla hirta*); 2, Heart's Ease (*Viŏla tricolor*).

abundant in fields, meadows, woods, &c., in Britain and in most parts of Europe, and the north of Asia; it is also found in North America, although it has probably been introduced there from the old world. It is a very variable plant, its flowers differing much in size and colour, but is readily distinguished by its large lyrato-pinnatifid stipules. The stem is somewhat triangular, branching, and diffused. In some of its most common forms, this plant is a mere despised weed, with small flowers; other wild forms have much larger flowers; and to it are referred the large and beautiful garden pansies, the varieties of which are innumerable. The Pansy (Fr. *pensée*, probably from the drooping attitude of the flower, suggestive of thoughtfulness) is one of the finest of florists' flowers, and no flower has been more improved by cultivation. Another species has of late years been introduced into cultivation, *V. Altaica*, a native of Siberia, and by itself, or by hybridisation with *V. tricolor*, has become the parent of many garden pansies. In a wild state, it has oval leaves, and large yellow or purple flowers. The finest garden pansies are not preserved or propagated without great difficulty, and require most careful cultivation, without which they quickly relapse to their wild forms. Florists demand that a pansy shall have a round, flat, and very smooth edge, the petals thick and velvety, the three lower petals alike in their ground colour, the lines or pencillings in the centre bright and distinct, the two upper petals—which always differ in colour from the others—perfectly uniform, the flower measuring at least an inch and a half across.—The SWEET-SCENTED V. (*V. odorata*) is common in grassy places in England, and throughout Europe and the north of Asia. The flowers are either of a deep blue colour, or more rarely white. Several other species, with pale blue flowers, and destitute of smell, are common in meadows and woody glades in Britain and other parts of Europe.—The DOG V. (*V. canina*) is one of the most common ornaments of hedgebanks.—North America has a number of species, one of which, *V. blanda*, is sweet-scented. The Himalayas produce a number of species very similar to those of Europe. The roots of several species of V. were formerly used in medicine. They contain a bitter alkaloid, *Violine*, which acts as an emetic and purgative. The petals of the sweet-scented V. are used for the preparation of *Juice* or *Syrup of Violets*, which is used as a gentle purgative for children, and also as a chemical test, being reddened by acids, and rendered green by alkalies. The bruised leaves of *V. tricolor* are sometimes used as a remedy for ringworm.—The DOG'S TOOTH V. (*Erythronium dens canis*) has no connection with this genus, but is a very beautiful flower of the natural order *Liliaceæ*.

VIOLET STONES, the name given to certain stones found upon high mountains, as in Thuringia, upon the Harz Mountains and the Riesengebirge, which, in consequence of being covered with what is called *Violet Moss*, emit a smell like that of violets. They retain this smell for a long time, and it is increased by moistening them.—The VIOLET MOSS (*Byssus Iolithus*), which some botanists have been inclined to rank with lichens, and others with fungi, consists of simple articulated threads, and spreads over the stones in the form of a delicate incrustation, which at first is reddish brown, but in a more advanced stage, yellowish green. It was formerly in use as a popular remedy for feverish cutaneous eruptions.

VI'OLIN (diminutive from *viol*), a stringed musical instrument played with the bow. Like other bow-instruments now in use, it consists of a wooden sonorous chest, formed of two slightly arched surfaces, known as the back and belly, united by sides or ribs, and with a curve or hollow on each side in the middle of the length—a neck or fingerboard attached to the chest, and strings, fastened at one end to the belly by a tailpiece or projection of wood, and at the other to the head or

extremity of the neck, where they can be tightened or loosened at pleasure by turning-pins. The strings thus passing over the belly are raised up from it by a bridge; and on the belly there are two sound-holes opposite each other, of a form resembling the letter *f*, or rather the long *ʃ*. The sounds are produced by drawing a bow across the strings, the upper surface of the bridge being convexly curved, so as to enable the bow to be drawn along each string separately, without coming in contact with the rest. The modern violin has four strings of gut, the lowest covered with fine silvered copper wire, or sometimes, in the best instruments, with silver or even gold wire. These strings are tuned in fifths, thus, , and the highest string is called the first. The bow is held in the right hand, and the different sounds of each string are obtained by stopping, i. e., pressing it with the finger against the fingerboard at certain distances, thus shortening the vibrating portion, and raising the pitch of the sound. Very high notes are produced by the Harmonics (q. v.) of the string, which, instead of being pressed against the fingerboard, is touched lightly, the sound resulting from the vibration being, not as in ordinary cases, of the part of the string between the point of stopping and the bridge, but of a harmonic section of it. A peculiar modification of tone is produced by the application of the *mute*, or *sordino*, a little wooden instrument placed on the bridge. A violin or other bow-instrument may occasionally be played *pizzicato*, i. e., with the fingers, as a harp or guitar. The compass of the violin is about three octaves and a half, from  to , with all the intermediate semitones; but the highest notes are apt to be harsh and squeaking. Though chiefly an instrument of melody, it is to a limited extent capable of harmony by double stops—chords of two notes may be struck together, and three or four notes may be played in arpeggio. Few instruments can compare with the violin in power of expression and execution. It has an unlimited command over a very wide range of sounds, to which any degree of piano and forte, of staccato and legato, can be imparted. In orchestral music, there are always two different violin parts for treble and alto, known as first and second violin; and the same is generally the case when the violin is used in concerted music, the usual arrangement of stringed quartett music being for two violins, viola, and violoncello.

Recent writers trace the origin of the violin to the Indian *Ravanastron*, yet played by the poor Buddhist monks who go begging from door to door, and traditionally believed to have been the invention of Ravana, king of Ceylon, 5000 B.C. From the Ravanastron sprang the *Goudok* of Russia, and the *Cruth* of Wales—the latter in use before the 6th c. —both of which seem to have differed from later instruments of the same tribe in having the upper surface of the bridge flat, so that all the strings had inevitably to be sounded at once. The Viol (q. v.) was the more immediate precursor of the violin and of its relatives of deeper pitch, the violoncello and double bass. The earliest violins seem to have been those of Gasparo di Salo in Lombardy, 1560—1610. During the 17th c., the family of the Amati at Cremona, including Andrew, his sons Jerome and Antonio, and Nicolo, son to Jerome, produced violins the wonder of succeeding times, whose tone and quality more recent makers have in vain sought to equal. Antonio Stradivari, also of Cremona, pupil of Nicolo, if possible surpassed the Amati, and for a time the repute of Cremona was kept up by the families of the Guarneri and Ruggieri. Next to the Cremonese violins, in the estimation of connoisseurs, stand those of the Tyrolese makers, Jakob Stainer, and Matthias Klotz and his sons. Experience has shewn that the minutest details of form and proportion, and the material of which each separate part is made, are matters of vital importance to the quality of the violin. The great makers seem by a succession of delicate experiments and observations to have attained to acoustical qualities of high perfection, which their careful workmanship and extreme manual dexterity enabled them in all cases unfailingly to reproduce.—See Otto's *Treatise on the Structure and Preservation of the Violin;* Sandys and Forster, *History of the Violin;* Fetis. *Notice of Antonio Stradivari, with Researches on the Origin and Transformations of Bow-instruments.*

VIOLONCE'LLO (diminutive from Ital. *violone*, large viol or double bass), a large instrument of the violin class, held by the performer between his knees. It has four gut strings, the lowest of them covered with silvered copper wire, and is tuned thus, in fifths: . Its compass extends from  to . Its signature is usually the bass clef, the tenor or treble clef being used for the higher notes.

VIOTTI, GIOVANNI BATTISTA, an eminent violin-player, born at Fontanetto in Piedmont, in 1753, and chiefly educated under Pugnani at Turin. After holding for a short time the appointment of first-violinist in the royal chapel at Turin, he relinquished that office, in order to travel in Europe with Pugnani. In Berlin, St Petersburg, Paris, and London, his playing created a *furore*. He first visited London in 1792, and was engaged there at Salomon's concerts, and for a time as leader of the orchestra in the King's Theatre. A groundless charge raised against him of being a Revolutionary agent, drove him from England; but after living for a time in retirement at Hamburg, he returned to London, entered into speculations which ruined his fortunes, and died there in 1824. His compositions include violin concerts and quartetts for violin, tenor, and violoncello, violin duets and solos, and a few pianoforte compositions. His playing was characterised by a vigour of style and purity, as well as brilliancy and elegance, previously unknown; and he has been considered the father of the modern violin school.

VIPER (*Vipĕra*), a genus of serpents of the family *Viperidæ* (q. v.), having the head depressed, oblong-ovate, somewhat compressed before, and wider behind the eyes; the head covered with shields, the tail with two rows of plates beneath. Some naturalists divide the genus into two: *Vipĕra*, having one rather large shield in front of the head, the rest of the head covered with small shields, and the muzzle more or less recurved; and *Pelias*, having three shields on the head larger than the rest, the nose blunt. To the latter section belongs the common V. or Adder (*V. communis*, or *Pelias berus*), which is found throughout Europe from the

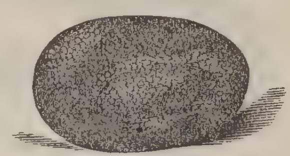
north of Russia to the Mediterranean, and is plentiful in most parts of England and Scotland. It is not found in Ireland. It seldom attains a length of much more than two feet. The head is depressed, and almost oval, slightly widening behind the eyes; the gape as long as the head. Although there are no teeth, except the poison-fangs, in the upper maxillary bones, there is a row of small teeth in the palatine bone on each side. The neck is rather smaller than the back of the head. From the neck, the thickness increases to near the middle of the entire length, and then diminishes to the vent. The tail tapers more rapidly, and ends in a point. The tail varies in the proportion of its length to that of the body, but is generally not more than one-third of the entire length. The smaller shields of

Common Viper or Adder (*Pelias berus*).

the head are in some specimens very symmetrically placed, but irregularly in others. The ground colour varies considerably, being in general nearly olive, rich deep brown, or dirty brownish yellow. A mark between and rather behind the eyes, a spot on each side of the hinder part of the head, a row of confluent rhomboidal spots running along the upper surface, the whole length of the body and tail, and a row of small irregular triangular spots on each side, are much darker than the ground colour, often almost black; and in all varieties of colour these markings appear. The under parts are of a lead colour. Vipers are sometimes found of colour very different from the ordinary kind, which some naturalists have too hastily described as distinct species. Thus, in some parts of England, a *Black V.* is occasionally met with, the ground colour of which is a rich black; the characteristic markings visible in particular lights, of a more intense black than the rest. A *Blue-bellied V.* has also been described, but differs little from the ordinary kind. A variety also occurs with the ground colour dirty white, the markings jet black. The *Red V.* has the ground colour brick-red, the markings rusty brown. It differs, however, from the ordinary kind in other particulars. There are some slight peculiarities in the markings, and the head is broader behind the eyes. The Red V. is found in some parts of the south of England.

The V. is the only venomous serpent found in Britain. Its bite is attended with much pain, and other serious consequences; but is seldom, if ever, fatal in Britain, although it is said to be so in warmer countries. The remedies employed for it are generally the external application of hot olive oil, and the internal use of olive oil and of ammonia, or strong stimulants such as brandy taken in large doses.

The V. inhabits heaths, dry woods, and dry banks. It preys on mice, frogs, small birds, and other small animals, which are killed by its poison-fangs, and swallowed entire. It hybernates during several months of the year, when many vipers may often be found entwined together in a torpid state. The poison is at this time inert, or nearly so. The V. is a good swimmer, and may occasionally be seen on lakes such as Loch Lomond, crosssing from one island to another. The young are produced in the early part of summer, from twelve to twenty or more at a birth. The V. is ovo-viviparous, the eggs probably bursting in the act of parturition. Their investing membrane is so thin and slight as to be very easily torn. The young V. is coiled up so closely in the egg as almost to appear a solid mass, but the moment it is set free it becomes active, and is ready to throw itself into an attitude of defence. The heat of the mother's body is not sufficient for the development of the embryo, as in mammals, but that of the sun is required, and the pregnant female viper may often be found stretched out in the sunshine, more lethargic than in ordinary circumstances.



Young Viper's Position in the Egg.

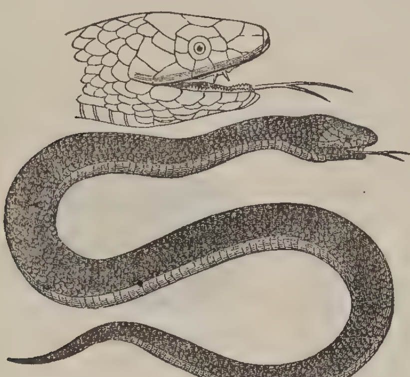
It has often been alleged that vipers swallow their young, to preserve them from danger—as, indeed, other serpents also are said to do—and there is nothing unreasonable in the supposition, as the young could live for some time in the stomach of the mother; but evidence is still wanting of the fact. The subject has been discussed, time after time, in publications devoted to natural history, but the original uncertainty still remains. Witnesses evidently truthful assert the fact, but eye-witnesses of the act of swallowing are wanted, the sum offered by Mr Frank Buckland to whoever will bring a V. with the swallowed young in her stomach, to be by him dissected, never having been claimed. That young vipers issue from the body of a crushed V., is easily accounted for, from what has been already stated.

The name V. (Lat. *Vipera*) is supposed to be a contraction of *Vivipara*, but the derivation is doubtful. The name Adder (Scot. *Ether*, Old English *Eddre* or *Neddre*) is from the Anglo-Saxon *Naedre*, nether or lower, a term applied to all serpents.

Pliny, Galen, and other ancient writers, ascribe great medicinal virtues to broth made of vipers, and to the flesh of the animal. Vipers entwined together in hybernation were supposed to produce the *Ovum Anguinum*, to which great virtues were imagined to belong; and *snakestones* were until lately quite common in many parts of Britain, sometimes rounded pieces of stone, rather larger than marbles, sometimes glass beads of various forms, which were supposed to cure vipers' bites, and to be otherwise useful.

VIPE'RIDÆ, a family of venomous serpents, having the upper jaw toothless, but with movable fangs in front, no pit between the nostrils and eyes, the scales generally keeled, the tail short and tapering. More than twenty species are known, natives of Europe, Asia, Africa, and Australia. No species has been found in America. To this family belong the Common Viper (q. v.) of Europe, the Horned Viper or Cerastes (q. v.) of Northern Africa and the west of Asia, the Puff Adder (q. v.) of Africa, and the Death Adder of Australia. The Death Adder (*Acanthophis tortor*) differs from most of the V. in not having the scales keeled. It is widely diffused

in Australia, where it is also known as the Black Snake. It is much dreaded, as its bite is said to be sometimes fatal in a quarter of an hour. It has two poison fangs on each upper jaw. The tail



Death Adder (*Acanthophis tortor*).

ends in a small recurved spine. The V. are most numerous in warm climates, in which also their bite is more deadly than in colder ones.

VIPER'S BU'GLOSS (*Echium*), a genus of plants of the natural order *Boragineæ*, having a calyx with five deep segments, an almost bell-shaped corolla, with dilated throat, and irregular limb, very long unequal filaments, and a bifid style. The species are large herbaceous plants or shrubs, rough with tubercles and hairs. Their flowers are often very beautiful. The COMMON V. B. (*E. vulgare*), a large annual plant, is a native of Britain and of most

Viper's Bugloss (*Echium vulgare*).

parts of Europe, growing in dry places, not unfrequently in corn-fields. Its flowers are at first reddish, and afterwards blue. It derives its name, V. B., from spots on its stem, which somewhat resemble those of the viper; and the property of healing vipers' bites was therefore ascribed to it. Other herbaceous species are found in the south of Europe, North and South America, and other parts of the world. Shrubby species are found chiefly in the Canary Islands and in South Africa.

VIRCHOW, RUDOLF. See SUPP. in Vol. X.

VIRE, an ancient and pretty town of Normandy, France, in the dep. of Calvados, on the Vire, 35 miles south-west of Caen. It is built almost entirely of granite, and is surrounded by hills, between which are the celebrated valleys of Vire—*Vaux de Vire* (see VAUDEVILLE). Manufactures of cloth, stationery, and cheese are actively carried on. Pop. 6366.

VIRGI'LIUS MA'RO, PUBLIUS, after Homer, the greatest epic poet of antiquity, was born in the consulship of Crassus and Pompey, on the 15th of October 70 B.C., at Andes, a village not far from Mantua. It is probable that his father was the proprietor of a small estate which was farmed by himself. V. was liberally educated, and is believed to have studied successively at Cremona and Mediolanum (Milan). In philosophy, he was instructed by Syron, an Epicurean, and one of his fellow-students was that Varus to whom his sixth Eclogue is dedicated. Greek he learned at Neapolis (Naples) from the grammarian Parthenius. If we are correct in supposing that, in the first Eclogue, V. relates his own experience in the person of Tityrus, he first visited Rome 41 B.C., in his 30th year, for the purpose of reclaiming his lands, which were occupied by the soldiery of Octavianus, at the close of the war against the republicans. At Rome, he was introduced to Octavianus, through the influence of Pollio, or of some other patron, and further formed the acquaintance of his great protector, Mæcenas. He continued to compose his Eclogues—the tenth and last of which is dedicated to Gallus, and referred to the poet's 33d or 34th year. At the instance of Mæcenas, he commenced his *Georgics* in his 34th year, according to the grammarians, who also assign seven years as the time he spent in the composition of the work, which was carried on principally at Naples. The *Æneid* was his last performance, and must have occupied many of the latter years of his life. He went in 19 B.C. to Greece, where he meant to subject his great poem to a thorough process of revision and refinement; and his voyage to Athens was made by Horace the occasion of the ode (Book i. 3) commencing with 'Sic te diva potens Cypri.' At Athens, V. met Augustus on his triumphal return from the East, and the poet was induced to go back to Rome in his company. He had only got as far as Megara, however, when he was seized with illness, which became worse on his voyage to Italy. On landing at Brundisium, or, according to another account, at Tarentum, he was unequal to the fatigue of travelling; and after lingering for a few days, he died, in the 52d year of his age, 19 B.C. In compliance with his dying wish, his body was removed to Naples, and buried at the second milestone from that city, on the Puteolan Way. Pliny the Elder and Aulus Gellius are among the writers who say that on his deathbed V. desired his epic poem to be burned, rather than that it should see the light in its imperfect state; but that the injunctions of Augustus to his executors, or, according to others, the interposition of his friends Tucca and Varius, who persuaded him to bequeath it to them on the understanding that it should remain unaltered, were the means of preserving it. The incident is quite in keeping with all that we know of V.'s modesty of character. The liberality of his patrons had endowed him with considerable property. He had a house on the Esquiline, near the gardens of Mæcenas, where he lived with an elegant simplicity, while he allowed the public free access to his excellent library. He was tall of stature, dark of

complexion, and had the appearance of a farmer. His most finished poem is the *Georgics*, in which the various departments of agricultural concern are described with great clearness, and illustrated by episodes of the finest poetry. His *Æneid* shews rather what he might have been than what he was as an epic poet. Unfinished as it is, however, its merits have always secured him a place in the front rank of epic writers; while, more than any similar work of antiquity, it has furnished a model to the epic and narrative poets of modern Italy. He has been edited and translated by scholars of nearly every country and period. The best English translation is still the hasty one of Dryden, though the recent version of the *Æneid* by Conington is in some essential features a highly successful performance. The best editions are those of Heyne, Wagner, Forbiger, and Conington.

VIRGIL, the Magician, is the character in which the great Roman poet presented himself to the popular imagination of the middle ages. The origin of this singular delusion may be thus explained. From a very early period—almost, we may say, from the age in which he flourished—V. was acknowledged to be the prince of Latin poets. His poems threw all others into the shade, and this, not so much because they exhibited a finer and more original genius, as because their style was perfect, the subject of his *magnum opus* thoroughly national, and his immense historical and antiquarian lore devoted to the glorification of the Roman people. From him the grammarians selected the examples of their rules, and even composed treatises on special questions suggested by his poems. The rhetoricians, too, found there material for their themes and declamations, and the later poets imitated his phraseology. Very soon the idea sprung up that in his verses there lay hidden quite a peculiar wisdom and mystic meaning. Thus it happened, that as early as the 3d and 4th centuries, even Christian authors (e. g., Minutius Felix, Lactantius, and Augustine) had contracted the habit of regarding him reverentially, a feeling which in its turn induced them to use him for polemical, or at least theological purposes. Hence they sought to prove the beginning of the fourth Eclogue a Messianic prediction, and would have it that V. foresaw the day of Christ. This view rooted itself so deeply, that V. and the Sibyl (q. v.) were actually introduced into the liturgy of the church, along with the Messianic prophecies of the Old Testament, and in the 'mysteries' of the middle ages, are frequently cited as bearing witness to a coming Messiah. Furthermore, when the first ages of polemical theology arrived, biblical critics and controversialists did not hesitate to quote the verses of V. in elucidation of passages of Scripture, and in confirmation of their views. Later still, some of the scholastics endeavoured to give a 'moral' significance to the whole *Æneid;* and an epitome of sacred history even was manufactured out of its contents (see CENTO). Another use, or rather *mis-use* of the verse of V. had already begun during the Roman Empire, and affords additional evidence of the superstitious reverence that was gradually encircling the name of the poet: we allude to the custom of trying to discover one's fortune by selecting lines at random from his epic. See SORTES BIBLICÆ, SORTES VIRGILIANÆ. Ultimately, as may be seen from the *Divina Commedia* of Dante, V. came to be considered as a representative of pure enlightened reason; a highly gifted genius standing midway between paganism and Christianity.

We have remarked that this deep, half-religious veneration for V. displayed itself at a very early period. Soon after his death, statues were erected to his memory, even in the domestic chapels of the emperors; the anniversary of his birth was held sacred; pregnant women and poets made pilgrimages to his tomb, and hence it became inevitable that all sorts of myths should spring up and attach themselves to his history; but the predominant conception in the middle ages was that of a wise, pure, and patriotic teacher, endowed with magic power and lore—quite a different kind of being from the evilly disposed and dreaded 'sorcerer' of popular fancy. The Virgilian myths established themselves more especially in connection with the places where he was born, where he chiefly lived, and where he died—Mantua, Rome, and Naples; and there they even yet survive in some measure on the lips of the people. But, curiously enough, it was not from the Italians, but foreigners, that they first obtained literary consideration. The oldest document bearing on the subject of which we have any knowledge, is the *Otia Imperialia* of the Englishman, Gervase of Tilbury, who collected his stories from the mouths of the Neapolitan populace. A fuller account is to be found in the *Chronicle* of Arnold of Lübeck, who got his information from Conrad, Bishop of Hildesheim, Chancellor of the Emperor Henry VI. These were followed by their contemporaries, Helinandus, whose legendary history of V. is embodied in the 6th book of Vincentius Bellovacensis' *Speculum Historiale*, and the English monk, Alexander Neckam, in his *De Naturis Rerum*, the best parts of which (relating to V.) are preserved in the repeatedly published *Vitæ Philosophorum* of Gualterus Burlæus. From these four main sources, the later Virgilian myth-mongers have chiefly borrowed; of whom the two chiefly deserving notice are Buonamente Aliprando (author of a Chronicle of Mantua in *terza rima*, about the beginning of the 15th c.), and the so-called Pseudo-Villani (author of *Le Croniche dell' inclita città di Napoli* (Naples, 1526). Particular stories and allusions are found pretty thickly scattered through the whole literature of the middle ages after the 13th century. The first complete collection, however, of the Virgilian myths was the French 'people's book,' entitled *Faictz Marcueilleux de Virgille*, published in the beginning of the 16th c., by Jehan Trepperel at Paris, translations of which soon after appeared in Dutch and English. Even the distant Icelanders had heard of the great magician, and there still exists in MS. an Icelandic *Virgilius-Saga.* The greater part of the Virgilian myths collected in the 'people's books' are of various ages and origin, and have come down to us in different forms. Some have decidedly been shaped after Eastern models, but the majority are of Latin and Italian growth.—See Zappert, *V.'s Fortleben im Mittelalter* (Vienna, 1851); Siebenhaar, *De Fabulis quæ Media Ætate de Virgilio circumferebantur* (Berl. 1837); and Edélestand du Méril, *De Virgile l'Enchanteur* in his *Mélanges Archéologiques et Littéraires* (Par. 1850).

VI'RGINALS, a keyed instrument of former times. As described by Dr Burney, it resembled in form a small pianoforte, with a compass of four octaves, furnished with a quill and jack like those of the spinet, and a single string to each note. Queen Elizabeth is said to have been a skilful performer on the virginals; but the instrument cannot, as popularly supposed, have been named in honour of the Virgin Queen, having been so called before her majesty's time.

VIRGI'NIA, one of the thirteen original United States of America, lies in lat. 36° 30′—39° 25′ N., and long. 75° 10′—83° 43′ W.; bounded on the N. by Pennsylvania, Maryland, and West Virginia, E. by Maryland and the Atlantic, S. by North

Carolina and Tennessee, and W. by Kentucky and West Virginia. Area, 38,352 square miles, or 24,545,280 acres. It is divided into 99 counties. The chief towns are Richmond (the capital), Petersburg, Norfolk, Staunton, Waynesborough, Alexandria, Portsmouth, Lynchburg, and Fredericksburg. Chesapeake Bay, which divides the south-eastern portion of the state, affords deep and spacious harbours. The chief rivers are the Potomac, forming the north-eastern boundary; the James, York, Chickahominy, Rappahannock, Rapidan, Appomattox, Shenandoah, and the Nottaway and Roanoke, which empty into Albemarle Sound in North Carolina. Eastern V. is level or rolling land, rising gradually from the ocean and Chesapeake Bay. The western portion is hilly and mountainous; through its centre from north-east to south-west run the ranges of the great Appalachian system of mountains: (1) a low range on the east, commencing with the Bull Run Mountains, near the Potomac; (2) the Blue Ridge, more elevated, through which the Potomac passes at Harper's Ferry, and which forms the eastern boundary of the Shenandoah Valley; (3) the Great North Mountain and the Alleghany, which form for many miles the north-west boundary of the state. The highest peak, White Top, in Grayson county, is 6000 feet. Other peaks rise from 4000 to 4500 feet. The Valley of Virginia, or of the Shenandoah, is from 1200 to 1500 feet above the sea. The eastern coast is composed of tertiary sands, clays, and marls; further inland, strata of the miocene groups emerge from beneath these, and abut against granite, gneiss, and other metamorphic rocks, at the line of the lowest falls of the principal rivers, the head of navigation, and sites of the chief towns. In the metamorphic belt are gold mines, copper, iron, &c. There are two upper secondary belts parallel to the Blue Ridge, crossing the James above Richmond, with rich coal deposits. The valley is of the Lower Silurian, with rich limestones, hematite iron, and a fertile soil. On the western borders are mineral springs (hot and cold), sulphur, salt, gypsum, lead, &c. The western coal region, which is cut through by large rivers, and is one of the finest in the world, extends into the state of West Virginia. There are also deposits of fine marble, porcelain clay, fire-brick clay, fine granite, soap-stone, slate, &c. Among the natural curiosities are the Natural Bridge in Rockbridge county; Wier's Cave in Augusta county; Blowing Cave, which sends out a blast of cold air in summer, and draws in air in winter; flowing and ebbing springs; the Natural Tunnel, 70 feet high, in Scott county, &c. The climate of the east and south-east, or low and level portions, is hot, with malaria in the swampy river-bottoms, producing bilious and remittent fevers; the higher regions are cold in winter, but a large portion of V. is pleasant and healthful. The soil of the eastern portion is light and good, but much exhausted by repeated tobacco-crops. The valley is rich, producing wheat, Indian corn, tobacco, and various fruits. The chief products are tobacco, corn, oats, wheat, cotton, wool, coal, lumber, oysters, market-vegetables, and game. V. had 1509 miles of railroad in 1873, and several canals. V. has just established a system of free public schools, which has not yet gone into operation. The system is to be administered by a board of education, a state superintendent of public instruction, county superintendents, and district trustees. The Normal School at Richmond is aided by the Peabody fund, and 20 pupils are in training for teachers. The Coloured Normal Industrial School at Hampton is aided by the same fund, and 16 pupils are in training. Trustees had been appointed in ten counties, and a number of schools were established prior to Nov. 1, 1870. There are state institutions for blind, and deaf and dumb. The insane asylum is the oldest in the U. S. The government is republican, with a governor, lieutenant-governor, attorney-general, and two houses of the legislature, all elected by the suffrages of the citizens.

V., whose shores were first explored by Sebastian Cabot, 1498, and again under the auspices of Sir Walter Raleigh in the reign of Queen Elizabeth, in whose honour it was named, was first settled by an English colony, under the charter of the London Company, at Jamestown, on the James River, May 13, 1607—a colony consisting of gentlemen of fortune, and persons of no occupation, no families, twelve labourers, and very few mechanics. The friendly Indians sold them land and provisions; but the diseases of a damp climate swept off half the settlers the first autumn. The energy of Captain John Smith saved the colony from destruction; and in 1609, it was reinforced with 500 persons, including 20 women and children, who were reduced by sickness and starvation to 60. They had embarked, to abandon the settlement, when Lord Delaware came with emigrants and supplies. The marriage of John Rolfe to Pocahontas (q. v.) secured the friendship of the Indians. In 1619, 90 respectable young women were sent out from England, and sold to the planters for 100 lbs. of tobacco each; also 100 convicts, to supply labour; and a Dutch trader also sold them 20 negroes. In 1622, the colony was reduced by wars and massacres from 4000 to 2500; but in 1624 it became a crown colony, and increased, so that, in 1649, there were 15,000 English, with 300 'good negro servants,' and 20 churches. The great production of tobacco caused such a fall in price, that half the crop was burned. In 1671, the population was 40,000, including 2000 black slaves, and 6000 English convicts and redemptioners, of whom 1500 a year were imported. The now prosperous colony consisted of 48 parishes, but had, Governor Sir William Berkley thanks God, no free schools or printing, which he hopes they may keep free of for a hundred years, and says: 'God keep us from both!' In 1754, the colonial militia took part in the French war; and Major George Washington was in General Braddock's expedition. In 1769, Thomas Jefferson, a member of the House of Burgesses, which had been established in 1619, asserted for the colony the right of self-taxation, denying the right of parliament to tax the colonies. In 1773, Patrick Henry, Thomas Jefferson, and Richard Henry Lee were appointed a committee to confer with the other colonies, and urged upon their delegates the Declaration of Independence. V., the earliest settled, largest, and most populous of the thirteen original states, called the Old Dominion, has been called the Mother of Presidents, four out of the five before 1825 having been Virginians. She was the first to propose the confederacy and the constitution. In 1861, April 17, the legislature of V. passed the ordinance of Secession. The Confederate government was invited to Richmond, which became the centre of military operations. V. was restored to her place in the family of states on January 26, 1870. See UNITED STATES. The pop. of V., in 1800, was 886,200, of which the slaves were 345,796; 1820, 1,065,379—slaves, 425,153; 1840, 1,239,797—slaves, 449,087; 1860, 1,596,318—slaves, 490,865; 1870, 1,225,163; 1880, 1,512,565.

VIRGINIA, WEST, a new state, separated from the above, because antagonistic in political interests, was organized in August, 1861, and admitted into the Union by act of Congress approved December 31, 1862, and taking effect June 20, 1863. The state comprises 53 counties, lying west of the Alleghanies, having an area estimated at 23,000 square miles, and a population, according to the census of 1870, of 442,014. In the same year there were 2113

school-houses in West Virginia (495 having been added during that year), and 87,330 pupils. Three normal schools have been opened, and the West Virginia University has gone into operation. In 1873 there were 572 miles of railroad in W. V. Pop. in 1880, 618,457.

VIRGINIA, UNIVERSITY OF, an institution of learning at Charlottsville, Albemarle County, Virginia, 4 miles from Monticello, the seat of Jefferson, by whom it was planned and organised. It was chartered by the state in 1819, and opened in 1825. It is governed by a rector and nine visitors; Jefferson and Madison having been the first two rectors. It has schools of ancient languages and history; modern languages, history, and literature; mathematics; natural philosophy, mineralogy, and geology; chemistry, pharmacy, and materia medica; law; medicine; &c. The state pupils are free. The degree of Bachelor of Arts is conferred upon graduates in Latin, Greek, chemistry, moral philosophy, and French or German (with certain proficiency in mathematics, physics, and history or literature); that of Master of Arts requiring a more extended prosecution of these studies, with satisfactory examination in review on all the subjects embraced in the courses of these schools. There are (1875) 368 students. Library, 35,000 vols.

VIRGINIAN CREEPER. See VITACEÆ.

VIRGI'NIAN QUAIL, or COLIN (*Ortyx*), a genus of birds of the family *Tetraonidæ*, closely allied to quails and partridges, but differing from both in having a shorter and thicker bill, and a rather more lengthened tail. They are also not so indisposed to leave the ground and perch on trees, on the branches of which they run with facility. They are all natives of America. The best-known species is the VIRGINIAN COLIN (*O. Virginiana*), which is abundant in most parts of North America, and in some parts is commonly known by

Virginian Quail (*Ortyx Virginiana*).

the name of Quail, in others by that of Partridge. In size, it is intermediate between the common quail and the common partridge of Britain. The prevalent colour of the plumage is brownish red, the under parts whitish; but all parts are more or less mottled with different colours. The feathers of the head are capable of being erected into a sort of crest. The call of the male is popularly regarded as resembling the words, *Ah, Bob White!* The coveys of the V. Q. often approach houses in winter, and mingle with domestic poultry. Great numbers are killed by guns and taken in snares; and in the western and southern states many hundreds are often caught in a day by parties of men on horseback, who drive the coveys into a great cylindrical net. This bird is easily domesticated, and seems well fitted for the poultry-yard. It has been introduced into some parts of Europe, and may almost be regarded as naturalised although still rare in England.—There are several other species of the genus in Mexico, California, and the north-west of America, of which one, the CALIFORNIAN COLIN (*O. Californica*), is remarkable for its long and beautiful black crest.

VI'RGIN ISLANDS, a group of islands in the West Indies, partly belonging to Denmark, partly to Britain, form a connecting link between the Greater and the Lesser Antilles, directly east of Puerto Rico. The islands and islets are about 50 in number, but of these, only a few are of any considerable size or importance. Three of the islands, with an area in all of 119 sq. m., belong to Denmark—viz., St Thomas (see THOMAS, ST), St Croix (see CROIX, STE), and St John (with an area of 21 sq. m.); and the other islands, the chief of which are Tortola, Virgin-Gorda, Anegada, Vieque, and Culebra, belong to Great Britain. The area of the British possessions of the V. I. is 94 sq. m., or over 60,000 acres (Statistical Tables, 1862); and the pop. in 1861 was 6051, of whom 476 were white, 1557 coloured, and 4018 black. The characteristic physical features are rugged heights and precipitous coast-lines, marked by numerous bays, havens, and creeks. Extensive tracts of land, possessed by the emancipated blacks, are covered with guinea-grass, which forms good pasturage for cows, sheep, and goats. A valuable mine of copper has been worked at Virgin-Gorda; and gold, silver, and other valuable minerals are said to have been found; but the inhabitants obtain their livelihood chiefly by wrecking. The government is in the hands of a lieutenant-governor, a council, and assembly. In 1867, the revenue amounted to £2030, the expenditure to £1370. The value of the exports in the same year was £8389; of the imports, £11,092. Cotton, sugar, ginger, and indigo are the principal products.

VIRGIN MARY. See MARY.

VIRGIN'S BOWER. See CLEMATIS.

VIRIATHUS, a Lusitanian (i. e., Portuguese) patriot, who energetically strove to prevent his country from falling under the dominion of the Romans. He flourished in the 2d c. B.C. Originally a shepherd, he afterwards became a guerrilla chief, and appears to have supported himself (like many of the Lusitanian borderers) by predatory excursions into the neighbouring Spanish territory. This mode of life brought him into collision with Rome, and in the year 151 B.C., the proprætor, Ser. Galba, was ordered to invade the country, and reduce the Lusitanians to subjection. By an act of detestable treachery, Galba succeeded in destroying a large body of the natives; but the few who escaped (among whom was V.) were inspired with the most implacable animosity towards the Romans, and immediately proceeded to rouse the patriotic passions of their countrymen. V. soon rose into prominence. At first, he kept mainly to the mountains, and contented himself with harassing the enemy by sudden and fierce descents, but in 147 (having been formally chosen leader in a season of great peril, he gave battle to Vetilius, the Roman proprætor, near Tribola (a town of Lusitania, south of the Tagus), and inflicted on him a severe defeat. In the course of the next two years he repeatedly came off victorious in conflict with Roman armies; until in 144, the consul, Q. Fabius Æmilianus, encountered him in Andalusia with a large army of 15,000 foot and 2000 horse, and V. was driven back into his native fastnesses. But the Spanish tribes themselves now broke out in insurrection against their foreign masters; and after 143, the Romans had both a Numantine and a Lusitanian war to wage. The general sent against V. was the proprætor, Q. Pompeius, who, after a slight temporary success, was

utterly crushed at the 'Hill of Venus,' and forced to take refuge at Corduba (in Andalusia), while the conqueror wasted all the country round the Guadalquivir. Next year (142), the Romans were more fortunate. Q. Fabius Servilianus, consul, conducted the war, and succeeded in driving V. once more out of Spain, and in annihilating several guerrilla bands; but in 141, a terrible reverse befel him near Grisane, when the whole of his army was hopelessly surrounded in a mountain-pass, and the story of the Caudine Forks (q. v.) was repeated, by its unconditional surrender. V., like Caius Pontius, shewed a noble magnanimity in his hour of supreme triumph: he allowed his captives to go away free and unhurt, on condition of Servilianus allowing the Lusitanians to retain their independence, and accepting their alliance. His terms were accepted, and the Portuguese patriot seemed to have triumphed over his colossal adversary; but in 140, the consul, Q. Servilius Cæpio (brother of Servilianus), having received the command in Further Spain, suddenly and treacherously resumed the war against V., and fearing lest he should not succeed in fair fighting, bribed some Lusitanian envoys (who had been sent to him by V. with offers of peace) to murder their master, which they did while he lay sleeping in his tent. The death of this heroic chief was practically the ruin of Lusitanian independence; for though the followers of V. elected another leader in his place, and strove to carry on the war, they could scarcely maintain themselves in the field for the rest of the year, and were then glad to acknowledge the supremacy of the Romans.

VI'RTUAL VELO'CITY. See WORK.

VI'RUS (the Latin word for a *poisonous liquid*) is a term used in medicine to signify those mysterious poisonous agencies which produce Zymotic Diseases (q. v.), such as smallpox, measles, scarlatina, the various forms of continued fever, ague, hooping-cough, cholera, syphilis, glanders, hydrophobia, &c. While each of these morbid poisons (as they are frequently called) has a definite and specific action, they collectively obey certain laws. For example (1.), their actions are variously limited, some affecting only one organ or system of organs, while others involve two or more organs or systems of organs. Thus, in bronchocele or goitre, we have an example of a poison acting only on the thyroid gland, while in hooping-cough and hydrophobia, all the organs supplied by the pneumogastric Nerves (q. v.) are affected, and, in paludal or malarian poison most of the organs. (2.) Morbid poisons, like medicines and ordinary poisons, have their period of latency, which, however, here is usually much prolonged. While a medicine, e. g., is seldom longer than a few hours in exhibiting its effects, the poisons of scarlatina, measles, and smallpox remain latent in the system for at least seven, ten, and sixteen days respectively; while that of paludal fever and hydrophobia may be dormant for a year or upwards. (3.) When several tissues or organs are acted on, the actions may be simultaneous, but are more commonly consecutive, a considerable interval often elapsing between the attacks. (4.) Another law of morbid poisons is, that two may co-exist in the same person; for example, smallpox and cow-pox have often been seen at the same time in the same person. In this case, each disease runs its course unaffected by the other; but most commonly, when two co-exist, one lies latent while the other runs its course. Thus, a case of intermittent fever may suddenly subside, and smallpox make its appearance; on recovery from this disease, the intermittent fever may return.

Amongst the peculiarities presented by morbid poisons, the following points must be noticed: (1.) In experiments made on the inoculation of the smallpox virus by Dr Fordyce, it was found that extremely diluted poison, if it acted at all, produced the same effects when introduced into the system as the concentrated virus. Hence it may be inferred that the intensity of the disease is not proportional to the amount of virus received into the system. (2.) Women in childbed may not only engender a special poison of this class—that of puerperal fever—but are highly susceptible of these poisons, and almost always succumb to their action. (3.) Another peculiar law of morbid poisons, and one wholly unknown in medicinal substances, is, as Dr Aitken remarks, 'the faculty which the human body possesses of generating to an enormous extent a poison of the same nature as that by which the disease was originally produced. A quantity of smallpox matter not so big as a pin's head will produce many thousand pustules, each containing fifty times as much pestilent matter as was originally inserted; and the miasmata secreted by one child labouring under hooping-cough are sufficient to infect a whole city.' A remarkable illustration of the development of syphilitic poison from a single infant over a whole province is given in the article SYPHILIS. (4.) A still more remarkable fact is, that many of these morbid poisons possess the property of seldom occurring more than once in the life of the same individual. This is the case with scarlatina, measles, smallpox, hooping-cough, and (to a less extent) typhoid and typhus fevers. (5.) This class of poisons is powerfully influenced by climate, and probably by the nature of the soil. Thus, the severe forms of typhus so common in this country are hardly known in warmer climates, and the influence of cold weather on cholera and plague are well known.—For further information on this subject, the reader is referred to Dr Robert Williams *On Morbid Poisons;* and to the chapter on Zymotic Diseases, in the first volume of Aitken's *Science and Practice of Medicine*, from which we have drawn most of the preceding remarks.

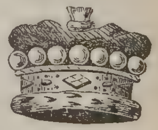
VISCONTI, a Lombard family which rose to sovereign rank in Northern Italy in the 13th c., and was equally distinguished by the share it took in the political contests of the Middle Ages, and by the services which it rendered to literature and science. The name V. is derived from the Latin *vicecomites*, and at first was merely the title of an office, but it gradually became a family surname, though when it came to be applied to this family authentic history fails to explain. The family descended, according to tradition, from Desiderius, the last king of the Lombards, and belonged to the feudal nobility of Northern Lombardy, having large estates near Lakes Como and Maggiore. The first who appears prominently in history is OTTONE, who became, in 1078, viscount of the archbishopric of Milan. The great Lombard families having, in course of time, split up into a multitude of lines, each in possession of a petty sovereignty, the V. on this account rose into comparative importance, more especially when, in 1262, another OTTONE was appointed archbishop of Milan by Pope Urban IV. This appointment, being considered by the people an infringement of the rights of the chapter, was opposed by them; and their leader, Martino della Torre, and his successors, kept possession of the property of the see, and forced the archbishop to exile himself for 15 years. At last, the exiled Ottone advanced at the head of a body of exiles and emigrants upon Milan, defeated and captured his rival in a bloody and desperate conflict near Desio (January 21, 1277), and entered the city amidst the acclamations of the people, who hailed

him as archbishop and perpetual lord of Milan. But he was not permitted to enjoy his newly-acquired dignities undisturbed, for, during the eleven years of his temporal sovereignty, he was engaged in almost uninterrupted warfare with the Torriani; and the contest was continued by his grand-nephew, MATTEO, who was chosen 'captain of the people' in 1288. Ottone continuing in the archbishopric till his death in 1295. Matteo proved himself a prudent and temperate ruler, and his influential position was recognised by the Emperor Adolf, who created him imperial vicar in Lombardy. Expelled by the Torriani and their allies in 1302, he was restored in 1311 by the aid of the Emperor Henry VII., and reappointed imperial vicar in consideration of the payment of 40,000 florins; and Pavia, Alessandria, Tortona, Cremona, Bergamo, Lodi, &c., having been forced to acknowledge his authority, the family became more powerful than ever. Unfortunately, however, a quarrel arose with Pope John XXII. regarding the appointment to the Milan archiepiscopate; and Matteo, obstinately refusing to yield to the papal pretensions, was condemned as a confirmed heretic, and himself and his descendants stigmatised as perpetually infamous (March 14, 1322). The people, despite their profound esteem and affection for their ruler, were horror-struck at this solemn denunciation; and the feeling that so many of his friends were falling away from him so preyed on Matteo's mind, that he died in June 1322, three months after his excommunication. His son GALEAZZO I. was chosen his successor, and immediately the pope proclaimed a religious crusade against the heretical V., and the 'holy army' under Raymond of Cardona advanced, in 1323, on Milan, committing the most horrible ravages during its march. But though the V. could not directly oppose such an overwhelming force, Galeazzo's brother Marco, an able and experienced warrior, hovered round the disorderly host, cutting off detached parties; and the Emperor Lewis (of Bavaria) having sent a body of troops to aid the V., the crusaders were driven back, totally defeated at Vavrio on the Adda (1324), and the remnant, with their leader Cardona, captured. Soon after, Galeazzo, by the intrigues of his ambitious brother Marco, was perpetually exiled, yet his eldest son, Azzo V., succeeded him, while Pope Nicolas confirmed the third son, Giovanni, in the archiepiscopate—events which led Pope John XXII., for the sake of maintaining some authority over Milan, to recal the excommunication he had pronounced against the Visconti. Azzo was the greatest prince of the race, and ruled Milan wisely and well; devoting his attention to the improvement and embellishment of the city, in which labour he was aided by the painter Giotto (q. v.) from Florence, and the sculptor Balducci from Pisa. As great in war as in peace, he extended his sway over almost the whole of Lombardy; and on his death in August 1339, 3000 citizens of Milan voluntarily assumed the garb of mourning. The council-general of Milan elected his two uncles, the archbishop GIOVANNI and LUCCHINO, as joint rulers in his stead; and on the latter, who was an able, resolute, and unscrupulous prince, wholly devolved the cares of the temporal sovereignty. Under his sway, Montferrat was added to the dominions of the V.; Pisa became tributary; a regular police was established; all offenders were punished with impartial severity; and a summary judgeship of appeals (*exgravator*), open only to foreigners to prevent party bias, was established. But the vices of suspicion, lust, and revenge threw a deep gloom over Lucchino's eminent qualities, led him into the commission of many cruel and tyrannical acts, and indirectly caused his own death by poison in January, 1349. From this time, the mild and peaceful archbishop reigned alone, availing himself of the assistance of his nephews in the more arduous tasks of government. He purchased Bologna for 200,000 florins in 1350; in 1353, accepted the lordship of Genoa, which had been almost crushed by its rival, Venice; and taking up the quarrel of his new subjects, equipped a fleet which, under Paganino Doria, gained a complete victory over the Venetians. He was the generous patron and friend of Petrarch, and the last good prince of the V. family. His three nephews conjointly succeeded him in October 1354; but in 1355, the eldest had died of poison, and his dominions were shared between the other two, GALEAZZO and BARNABO. Both princes were men of pre-eminent ability, but irreclaimably vicious, the latter being a very monster of cruelty. Bologna, which belonged to Barnabo, fell into the hands of the pope, who excommunicated Barnabo for attempting to recover it; but the V. prince laughed at the holy father's curse, and swore that he would be both pope and emperor in his own dominions. Innocent VI. then sent legates to him to propose terms, but the young savage compelled the unfortunate messengers to tear their master's bulls to fragments, and swallow them piece by piece. One of the legates, on becoming pope as Urban V., took revenge by proclaiming a crusade against Barnabo, which was joined by all the principal Italian princes; the Romagna and the borders of Lombardy were desolated by a long desultory strife; and though Barnabo was ultimately forced to accept a sum of money in place of Bologna, he took a humorous revenge on his ecclesiastical antagonists by compelling the clergy in his dominions to pay all the expenses of the war. One act of his, however, may be mentioned with commendation: he issued an edict forbidding even the mention of the names 'Guelf' and 'Ghibelline' under pain of having the tongue cut out; and his well-known stern adherence to such promises put an end to this long and mischievous controversy. His brother Galeazzo, who had established his residence at Pavia, was the 'Mæcenas' of his time: he steadily befriended Petrarch; founded, under his direction, the University of Pavia; and collected a considerable library. The invention known as 'Galeazzo's Lent,' a system of torture calculated to prolong the victim's life for 40 days, stamps him with the family character of cruelty. On Galeazzo's death, his son, GIAN-GALEAZZO, succeeded (1378) him in Pavia and its dependencies; and by treacherously seizing and imprisoning his uncle Barnabo of Milan, became sole ruler of Lombardy. He had all the great qualities and most of the vices of his race, and openly aspired to the sovereignty of Italy; conquering Padua, Verona, Vicenza; extending his dominions to the gates of Florence, which he also attacked; and purchasing from the Emperor Wenceslas the absolute sovereignty of his dominions, with the title of *Duke of Milan*, for 100,000 gold florins. This curtailment of the empire, however, displeased Germany, but the Palatine Ruprecht, who invaded Lombardy, received such a lesson from the condottieri of Alberico da Barbiano at Brescia, as caused him to gladly seek the north side of the Alps. Florence, the only remaining obstacle to the accomplishment of the V.'s ambitious scheme, was on the point of surrendering, when Gian died of the plague in 1402. He was a great patron of letters and science, gathered eminent men of all classes around him, reorganised the university of Piacenza, established a magnificent library, constructed the famous bridge over the Ticino at Pavia, and commenced the erection of the cathedral of Milan. His daughter Valentina married Louis, the younger brother of Charles VI. of France, and became grandmother of Louis XII., who upon this

relationship founded his claims to the Milanese. His sons, GIAMMARIA V. (Giovanni-Maria) and FILIPPO-MARIA V., reigned in succession; but the former, who was cowardly, suspicious, and of a cruelty partaking of insanity, was, in the interests of his subjects, stabbed to death, May 16, 1412; and the younger brother, equally timorous and suspicious, and of only average cruelty, became sole ruler. The Venetians on the east, the Marquis of Montferrat on the west, and the pope on the south, were rapidly curtailing his dominions, when, by a happy stroke of policy, he espoused Beatrice di Tenda, the widow of a condottieri leader, and thus obtained the services of a veteran band of soldiers. His fortunate choice of Carmagnola (q. v.) as his general led to the restoration of the former boundary-line of his dominions; and on his quarrel with the soldier who had served him so well, he was sagacious enough to supply his place by others as nearly equal in ability as could be obtained. In 1441, he engaged the services of Francesco Sforza, to whom he gave his natural daughter Bianca in marriage; and on his death in 1447, the V. family was succeeded by that of Sforza (q. v.) in the lordship of the Milanese. Collateral branches of the V. still exist in Lombardy.—See Lilla's *Famiglie Celebri Italiane*, Verri's *Storia di Milano*, and Muratori's *Annali d'Italia*.

VISCONTI, a family of archæologists and architects, the first of whom to rise to prominence was GIOVANNI BATTISTA V., a native of Sarzana, who settled at Rome, and after making for himself a great name as an archæologist, succeeded Winckelmann as prefect of the antiquities of Rome. He was employed by Clement XIV. and Pius VI. to collect works of ancient art for the Museum of the Vatican ('Museo Pio Clementino,' as, from its two principal benefactors, it was called); and afterwards, in 1776, commenced the writing of the letter-press which was intended to accompany the series of engravings of that splendid collection. He died in 1784.—ENNIO-QUIRINO V., eldest son of the former, was born at Rome, November 1, 1751, and was educated by his father, who intended him for the church. This profession, however, he afterwards refused to adopt, and was for a time disowned by his father. But at last, in 1778, the old man was glad to call his son to his aid, and together they prepared the first volume of the engravings of the *Museo Pio Clementino*. In 1784, he edited alone the second volume of the same series; he was also appointed conservator of the Capitoline Museum. The series of engravings of the *Museo* was regularly issued, the seventh and last volume being published in 1807. When Rome fell into the hands of the French, V. became a member of the provisional government, and afterwards one of the five consuls; but in November 1799, the arrival of the Neapolitan army forced him to emigrate to France, and from this time he settled at Paris. His great reputation as an archæologist having been long recognised among the learned men of the French capital, he was made an administrator of the Louvre, and Professor of Archæology; and drew up a catalogue of the works of art in the new museum (many of the items being his old familiar acquaintances of the Vatican), which, from the frequent raids of Napoleon on foreign collections, required to be frequently re-edited and enlarged. In 1804, he was requested by the emperor to select and publish a series of portraits of the distinguished men of ancient Greece and Rome; and this, probably the greatest of his works, appeared in two parts, *Iconographie Grecque* (3 vols. 4to, 1808) and *Iconographie Romaine* (1 vol. 4to, 1817). Contemporaneously, V. issued from time to time papers and dissertations on particular objects of ancient art. In 1815, he came to London by express desire of the British government, to fix a fair price for the Elgin Marbles (q. v.), and on his return wrote a Memoir explanatory of these sculptures. His last work was to complete his *Illustrazioni di Monumenti scelti Borghesiani* (Rome, 1821). He died after a long illness, February 1818, and his death was a source of grief to the learned throughout Europe, many of whom came from great distances to attend his funeral. Besides his immense antiquarian knowledge, V. possessed an extensive acquaintance with the history, languages, mythology, and manners of the classic age. A complete collection of his works was commenced at Milan in 1818, but has not been completed. See *Antologia* of Florence, No. 18; Tipaldo's *Biografia degli Italiani Illustri;* and Maffei's *Storia della Letteratura Italiana*.—His younger brother, FILIPPO AURELIO, was also an eminent archæologist, and was president of the commission of antiquities and fine arts at Rome from 1809 to 1814. He edited the *Museo Chiaramonti*, a sequel to the *Museo Pio Clementino*, and published several other works; but his chief attention was bestowed upon numismatology. He died at Rome in 1830.—LOUIS-JOACHIM V., the son of Ennio Quirino, was born at Rome in 1797, and after a careful education at Paris, was apprenticed to an architect. His progress in his profession was rapid, as he was appointed an inspector of public buildings as soon as his apprenticeship had expired, and shortly afterwards became one of the architects and surveyors of Paris, and architect of the Bibliothèque Royale in 1825. His works include various public monuments in honour of eminent Frenchmen, some of the first fountains of Paris, the tomb of Napoleon I., and various hotels and private residences, the chief of all being the plans for the completion of the Louvre on a most magnificent scale. V. died at Paris, 29th December 1853.—The nephew of the preceding, PIERRE-HERCULES V., is a celebrated archæologist, and Professor of Archæology in the French Academy.

VI'SCOUNT (Lat. *vice*, in place of, and *comes*, earl), originally the officer who acted as deputy to the earl, the earl being the king's immediate officer within his county. When the title of earl, originally personal, became hereditary, which took place in England under William the Conqueror, a deputy had necessarily to be appointed in all cases where he was a minor, or otherwise incapacitated from discharging the duties of his office. This deputy gradually became a permanent officer, otherwise known as the Sheriff, whose Latin designation continued to be *vicecomes*. The hereditary title of viscount is a degree of nobility unconnected with office. It was first granted in England to John Beaumont, created a peer by the title of Viscount Beaumont in 1440. A viscount is now the fourth degree of nobility in the United Kingdom. His coronet consists of a chased circlet of gold, round which are ranged an indefinite number of pearls, nine of them being most generally shewn, smaller than those of a baron's coronet, and in contact with each other. The mantle is scarlet, and has two doublings and a half of ermine. A viscount is styled 'Right Honourable;' his wife is a viscountess; his eldest son has no courtesy title of peerage; but all his sons and daughters are styled 'Honourable.'



Viscount's Coronet.

VI'SCUM. See MISTLETOE.

VISE (*Escalier à Vis*), a spiral or corkscrew

staircase, the steps of which wind round and rest on a perpendicular pillar, called the Newel (q. v.). In the Norman style, the steps rested on a spiral arch; but in later times, the steps were formed of single stones, stretching from the newel to the wall. This kind of staircase was that most generally used in medieval buildings.

VI'SEU, an episcopal city of Portugal, in the province of Beira, stands in a wide, fruit-producing plain, at the height of 1300 feet above sea-level, 50 miles north-east of Coimbra. Its cathedral is a striking flamboyant edifice, and contains a number of excellent pictures by Gran Vasco, the Portuguese Fra Angelico. In the vicinity is the Roman camp, called Cava de Viriato. The town, which is one of the oldest in the country, contains other Roman as well as Gothic and Moorish remains. A large fair is held here. Pop. 9160.

VI'SHNI-VOLOTCHE'K, a town of Russia, in the government of Tver, about 230 miles south-east of St Petersburg by railway. It is situated on the Tzna, on the Vishni-Volotchek water-route constructed by Peter the Great, and connecting the navigation of the Baltic and Caspian Seas, by means of the Volga, &c. There is a very extensive transit-trade. An immense quantity of corn passes through the town every year. Pop. 13,873.

VISHN'U is the second god of the Hindu triad, but is considered by his worshippers to be the supreme deity of the Hindu pantheon. See TRIMÛRTI and VAISHN'AVAS. The word is derived, by *S'ankara* (q. v.), in his commentary on the thousand names of V., and by other commentators after him, from *vish*, encompass, or *vis'*, penetrate; when, according to them, it would imply the deity who encompasses or penetrates the whole universe, both as regards its exterior appearance and its inward essence. A similar etymology is assigned to the word by *Yâska* (q. v.) in his gloss on the R'igveda; but as in this Veda, V. does not yet embody the notions connected with him at the epic and Purânic period of Hinduism (see INDIA, sec. *Religion*), Yâska does not impart to the name the implied sense given to it by the commentators just mentioned. In the R'igveda, V. is a representation of the sun, who 'strides through the seven regions of the earth,' and 'in three ways plants his step' (or, as Yâska explains, plants his steps so as to become threefold). And, according to one predecessor of Yâska, these three steps mean the manifestation of the sun at its place of rising, on the meridian, and at its place of setting; or, according to another, its manifestation on earth, in the intermediate space, and in heaven; when—as a later commentator observes—in the first of these manifestations, V. represents fire; in the second, lightning; and in the third, the solar light. From this position which V. holds in the R'igveda (see Veda), it results that he was not regarded there as supreme, or even as equal to other deities, who, at the Vedic period, occupied a foremost rank. He is extolled in several hymns as having 'established the heavens and the earth,' as 'being beyond mortal comprehension,' and so forth; but he is there also described as having derived his power of striding over the world from *Indra* (q. v.), and as celebrating the praises of this god. He is frequently invoked together with the latter, but apparently always as inferior to him; and often, too, he occurs in company with a number of other gods, such as Varun'a, the Maruts, Rudra, Vâyu, the luminous deities called *Âdityas*, and others, without any distinction being drawn in their respective rank. Fewer hymns, moreover, are separately devoted to his praise than to that of Agni, Indra, or other prominent gods of the Vedic period; and it deserves notice, too, that at that period he was not yet included amongst the Âdityas, for only at the epic period, when the number of these deities, originally varying from six to eight, was raised to twelve, V. was included in it—he then being named as the foremost of these luminous offsprings of Aditi, or space.

Although some of the Brâhman'as of the Vedas (q. v.) already shew the progress which the solar V. had made in the imagination of the people, and although they contain the germ of several legends, which, at a later time, became fully developed, the really mythological character of this god, as the basis of the divine worship now paid him by a large class of the Hindu population, belongs to the epic poems—the *Râmâyan'a* and *Mahâbhârata* (q. v.)—and to the *Purân'as* (q. v.). In the Mahâbhârata, V. is often identified with the supreme spirit; but while in some portions of this poem—the different parts of which belong to different epochs of Hindu antiquity—he is thus regarded as the most exalted deity; he is again, in others, represented as paying homage to S'iva (q. v.), the third person of the Trimûrti, and as acknowledging the superiority of this god over himself. Taking, therefore, the Mahâbhârata as a whole, he does not occupy, in this epos, the exclusive supremacy which is assigned to him in the Râmâyan'a, and still more in those Purân'as especially devoted to his praise.

The large circle of myths relating to V., in the epic poems and Purân'as, is distinguished by a feature which, though not quite absent from the mythological history of S'iva, especially characterises that of Vishn'u. It arose from the idea, that whenever a great disorder, physical or moral, disturbed the world, V. descended 'in a small portion of his essence' to set it right, to restore the law, and thus to preserve creation. Such descents of the god are called his *Avatâras* (from *ava* and *tr'i*, descend); and they consist in V.'s being supposed to have either assumed the form of some wonderful animal or superhuman being, or to have been born of human parents, in a human form, always, of course, possessed of miraculous properties. Some of these Avatâras are of an entirely cosmical character; others, however, are probably based on historical events, the leading personage of which was gradually endowed with divine attributes, until he was regarded as the incarnation of the deity itself. With the exception of the last, all these Avatâras belong to the past; the last, however, is yet to come. Their number is generally given as ten, and their names in the following order: 1. The fish-; 2. The tortoise-; 3. The boar-; 4. The man-lion-; 5. The dwarf-; 6. The Paras'u-Râma-; 7. The Râmachandra, or, briefly, Râma-; 8. The Kr'ishn'a and Balarâma-; 9. The Buddha-; and 10. The Kalki- or Kalkin-Avatâra. This number and enumeration of Avatâras, however, was not at all times the same. The Mahâbhârata, though also mentioning ten, names successively the Hansa-, tortoise-, fish-, boar-, man-lion-, dwarf-, Paras'u-Râma-, Râma-, Sâtvata-, and Kalkin-Avatâras. The Bhâgavata-Purân'a speaks of twenty-two Avatâras of V., which, for instance, also comprise Prithu (q. v.), Dhanvantari, the god of medicine, and Kapila, the reputed founder of the Sânkhya (q. v.) philosophy. Other works have twenty-four Avatâras, or even call them numberless; but the generally-received Avatâras are those ten mentioned before, an idea of which may be afforded by the following brief account.

1. The *Matsya-* or *fish-Avatâra*.—When, at the end of the last mundane age, the Bhâgavata-Purân'a relates, Brahman, the first god of the Trimûrti, had

fallen asleep, a powerful demon, *Hayagrîva*, stole the Vedas which had issued from the mouth of Brahman, and lay by his side. About that time, a royal saint, *Satyavrata*, had by his penance attained the rank of a Manu, and V., who had witnessed the deed of Hayagrîva, and intended to slay him, assumed for this purpose the form of a very small fish, and glided into the hands of the saint when the latter made his daily ablutions in the river. Manu, about to release the little fish, was addressed and asked by it not to expose it to the danger that might arise to it from the larger fish in the river, but to place it in his water-jar. The saint complied with its wish; but in one night the fish grew so large, that at its request he had to transfer it to a pond. Yet soon the pond also becoming insufficient to contain the fish, Manu had to choose a larger pond for its abode; and, after successive other changes, he took it to the ocean. Satyavrata now understood that the fish was no other than *Nârâyan'a* or V., and, after he had paid his adoration to the god, the latter revealed to him the imminence of a deluge which would destroy the world, and told him that a large vessel would appear to him, in which he was to embark together with the seven Rishis, taking with him all the plants and all the seeds of created things. Manu obeyed the behest of the god: and when the water covered the surface of the earth, V. again appeared to him in the shape of a golden fish with a single horn, 10,000 miles long; and to this horn Manu attached the vessel, by means of V.'s serpent serving as a cord. While thus floating in the vessel, Manu was instructed by the fish-god in the philosophical doctrines and the science of the supreme spirit; and after the deluge had subsided, the fish-god killed Hayagrîva, restored the Vedas to Brahman, and taught them to the Manu Satyavrata, who in the present mundane age was born under the name of *S'râddhadeva*, as the son of Vivasvat. —A fuller account of this Avatâra is given in the *Matsya-Purân'a*, where the instruction imparted to Manu by the fish-god includes all the usual detail contained in a Purân'a (q. v.), that relating to creation, the patriarchs, progenitors, regal dynasties, the duties of the different orders, and so forth. In the Mahâbhârata, where the same legend occurs, but without either that portion concerning Hayagrîva, or the instruction imparted by the fish, there is, besides minor variations, that important difference between its story and that of the Purânas, that the fish is not a personification of V., but of Brahman, and that the deluge occurs in the present mundane age, under the reign itself of the Manu, who is the son of Vivasvat.—The origin of this Avatâra is probably a kindred legend, which occurs in the *S'atapathabrâhman'a*, of the White Yajurveda (see VEDA); but there the fish does not represent any special deity, and the purpose of the legend itself is merely to account for the performance of certain sacrificial ceremonies.

2. The *Kûrma-* or *tortoise-Avatâra.*—When, of old, the gods felt their powers impaired, and were desirous of obtaining *Amr'ita*, the beverage of immortality, V. directed them to churn, together with the demons, the milk-sea, by taking the mountain *Mandara* for their staff, and his serpent *Vâsuki* for their cord, the gods to stand at the tail, and the demons at the head of the serpent; while he himself consented to support the mountain on his back, after having assumed the shape of a gigantic tortoise. The result of this churning of the sea of milk, was, besides the ultimate recovery of the Amr'ita, the appearance of a variety of miraculous things and beings; but it also led to a violent contest between the gods and demons, in which the latter were defeated. See RÂHU.—The idea of the lord of creation assuming the shape of a tortoise, and that of sacrificial liquids, especially clarified butter, becoming tortoise-shaped (*Kûrma*, the word for tortoise, meaning literally, 'badly or slowly going'), occurs also in the Yajurveda; but the legend on which the tortoise-Avatâra of V. is based seems to belong entirely to the post-Vedic period of Hinduism.

3. The *Varâha-* or *boar-Avatâra.*—It is supposed to have taken place when, at the period of creation, the earth was immersed in water, and V., in order to raise it up, assumed the form of a gigantic boar. In the earlier recension of the *Râmâyan'a* and the *Linga-Purân'a*, it was Brahman, the creator of the universe, who transformed himself into a boar for rescuing the earth from its imperilled position; and in the *Black Yajurveda*, where this idea is first met with, it is likewise said that the lord of creation upheld the earth, assuming the form of a boar. At a later period, however, this Avatâra is generally attributed to Vishn'u. Between both conceptions there is, however, also this great difference, that in the former the transformation of the deity into a boar has apparently a purely cosmical character, whereas in the latter 'it allegorically represents the extrication of the world from a deluge of iniquity, by the rites of religion.' (Wilson's translation of the *Vishn'u-Purân'a*, second ed., by F. Hall, vol. i. p. 59, note.) For the boar, as an incarnation of V., is the type of the ritual of the Vedas. He is described as the sacrifice personified; his feet being the Vedas; his tusks, the sacrificial post to which the victim is tied; his teeth, the sacrificial offerings; his mouth, the altar; his tongue, the fire; his hairs, the sacrificial grass; his eyes, days and night; his head, the place of Brahman; his mane, the hymns of the Vedas; his nostrils, all the oblations; his snout, the ladle of oblation; his voice, the chanting of the Sâmaveda; his body, the hall of sacrifice; his joints, the different ceremonies; and his ears as having the properties of voluntary and obligatory rites (*Vishn'u-P.*, vol. i. p. 63); and similar descriptions of the boar occur in the Harivan's'a (q. v.) and elsewhere; besides those relating to the immense size and wonderful appearance of the mysterious animal. In the *Bhâgavata-Purân'a*, another legend is also connected with this incarnation of V., still more distinctly proving that, at the Purân'ic period, it was viewed in a purely religious light. According to this legend, *Jaya* and *Vijaya*, two doorkeepers of V., once offended some Munis who claimed admission to the paradise of V., and in consequence were doomed to lose their position in V.'s heaven, and to be reborn on earth. They became thus the sons of *Kas'yapa* and *Diti*, under the names of *Hiran'yakas'ipu* and *Hiran'yâksha*. The former subdued the three worlds, and the latter went straight to heaven, to conquer also the gods. Thus threatened in their existence, the gods implored the assistance of V.; and V., who at that period was the mysterious or primitive boar, slew Hiran'yâksha. A similar contest between V. as boar and numerous demons, the progeny of Diti, always ending in the defeat of the latter, is also described in the *Mokshadharma*, one of the later portions of the Mahâbhârata; and from this and similar descriptions, it follows that the boar-Avatâra had gradually lost its original character, and assumed that common to the remaining Avatâras, of representing the deity as become incarnate, for the purpose of remedying moral or religious wrong, or of destroying influences hostile to the pretensions of the Brâhmanic caste.

4. The *Nr'isinha-* or *man-lion-Avatâra.*—*Hiran'yakas'ipu*, the brother of the demon Hiran'yâksha just mentioned, had resolved to become a sovereign

of the three worlds, and exempt from death and decay. To attain this end, he practised severe austerities, and ultimately received from Brahman, as the desired reward, a promise that he should become a supreme ruler, and death should not accrue to him from any created being, neither within his abode nor without, neither by day nor by night, neither in heaven nor on earth, nor by any kind of weapon. Possessed of the grant of this boon, he now gave course to the hatred he had conceived against V. for having killed his brother Hiran'yâksha. He oppressed all the gods, robbed them of their shares in the sacrifices, and threatened their destruction. But he had a son, *Prahrâda* or *Prahlâda*, who, through his religious studies and pious conduct, had become a devout worshipper of Vish'nu. When Hiran'yakas'ipu became aware of his son's partiality for this god, he first endeavoured to impart to him his own hostile feelings against V., but failing in this, resolved to kill him. All the means, however, he employed to this end remained vain; and when at last, Hiran'yakas'ipu, about to cut off the head of his son, sneeringly asked him why V., who, as he asserted, was everywhere, should not be present also in a pillar in the hall, which he struck with his fist, V. suddenly made his appearance in the shape of a being neither man nor animal, in that of a man-lion of fearful aspect and size; and after a violent struggle with the demon, killed him in tearing his heart out with his finger-nails. Prahlâda was then installed by him as sovereign over the demons, and, at the end of a pious reign, obtained final liberation.

5. The *Vâmana-* or *dwarf-Avatâra.*—Prahlâda's son was *Virochana*, and his son was *Bali*. The latter, after having conquered Indra (q. v.), ruled over the three worlds, and filled the gods with dismay for their future prosperity. They had, in consequence, recourse to V.; and when, at one time, Bali was celebrating a grand sacrifice, V., assuming the shape of a dwarf, humbly approached the demon king. Pleased with the devout and unpretending appearance of the little Brâhman, Bali asked him to demand a boon, however costly it might be. The dwarf, however, merely asked for so much ground as he could measure with three paces. The king smilingly granted so modest a request, though his family priest *Us'anas*, suspecting the true nature of the dwarf, strongly dissuaded him from doing so. But when the dwarf had obtained what he asked for, he strode with one pace over the earth, with a second over the intermediate space (the atmosphere), and with a third over the sky, thus leaving for Bali only the subterranean regions, which he assigned him for his future abode. The demons endeavoured to frustrate this result, after V. had taken his first two strides, but they were overcome by the followers of V.; and Bali, when resigning himself to his fate, in reply to a reproach addressed to him by the dwarf for trying to break his promise, uttered—according to the Bhâgavata-Purân'a—the following words, which may serve as one of many instances to shew how sacred a promise was held by the Hindus when once given, and even though artfully obtained: 'If, renowned chief of the gods, you consider the word which I uttered to be deceitful, I now do what is sincere, and can be no deception—place your third step on my head. Fallen from my position, I fear not the infernal regions, or binding in bonds, or misfortune difficult to escape, or loss of wealth, or your restraint, so much as I am afflicted by a bad name.' (See J. Muir's *Original Sanscrit Texts*, vol. iv. p. 128.) For his righteousness, he was then rewarded by V. with the promise, that after a temporary residence in one of the most delightful places of Pâtâla (q. v.), he should be born as the Indra, in the reign of the eighth Manu. In this incarnation as dwarf, V. is considered to have been a son of the same Kas'yapa who is also the father of Hiran'yakas'ipu and Hiran'yâksha; but while their mother is Dita, the dwarf's mother is Aditi (space); and since she previously had brought forth Indra, V. is sometimes called Upendra, or the younger or later Indra. As a son of Aditi, V. becomes one of the Âdityas (see before).—The Vedic conception of the three strides of V., as mentioned in the beginning of this article is doubtless the basis of the idea whence this Avatâra arose.

6. The *Paras'u-Râma-Avatâra*, or V.'s incarnation as Râma, the son of Jamadagni, armed with an axe (*paras'u*). *Arjuna*, a son of *Kr'itavîrya*, and king of the Haihayas, had obtained, as a reward for his piety, a thousand arms, and the sovereignty over the earth. The gods, frightened at his power, had recourse to V., and the latter resolved to be born as a son of Jamadagni, that he might slay him. Jamadagni was the son of *R'ichîka*, of the race of Bhr'igu, a pious sage who had married *Ren'ukâ*, the daughter of king *Prasenajit*, and had obtained five sons by her, the last of whom was *Râma*, or V. incarnate in this form. Ren'ukâ having once, for some supposed impropriety, incurred the anger of her husband, was, at his bidding, killed by her son Râma, but at the request of the latter, again restored to life; and her first four sons were likewise saved from the consequence of the wrath of Jamadagni by the intercession of their brother Râma. After this event had happened, or, as one account goes, previously to it, Arjuna came to the hermitage of Jamadagni, and was there hospitably received by the saint, who could treat him and his followers sumptuously, as he possessed a fabulous cow of plenty, that not merely supplied him with the milk and butter required for his sacrificial offerings, but with everything else he wished for. Struck by the precious qualities of this cow, and in spite of the kind treatment he had met with, Arjuna carried off with him the cow and her calf. When Râma, who, on this occasion, had been absent from home, returned to the hermitage, and learned what had happened, he took up his axe (or, as the Mahâbhârata says, his bow), and slew Arjuna, together with his army. The sons of the latter, to revenge their father's death, after some time, attacked the hermitage, and succeeded in killing Jamadagni. Thereupon, Râma made a vow to extirpate the whole Kshattriya or military race; and not satisfied with destroying the sons of Arjuna, he killed every Kshattriya whom he encountered afterwards. In this manner, the legend concludes, 'he cleared thrice seven times the earth of the Kshattriya caste'—killing the men of so many generations as fast as they grew to adolescence—'and filled with their blood the five large lakes of Samantapanchaka, from which he offered libations to the race of Bhr'igu.' He then performed a solemn sacrifice, and distributed the land and many riches amongst the ministering priests. The Mahâbhârata, which on two occasions relates this legend, in one place enumerates the Kshattriyas who escaped the destruction of their caste, and from whom the lines of the kings hereafter were continued; this account, however, is inconsistent with Purânic lists, in which the royal lineages are uninterrupted. There can be little doubt that a real historical conflict between the Brâhman'as and Kshattriyas underlies the conception of this Avatâra; one which has its parallel in the history of Vasisht'ha and Vis'wâmitra (q. v.).

7. The *Râmachandra-* or, briefly, *Râma-Avatâra.*—*Râvan'a*, a king of *Lankâ*, or Ceylon, a monster with ten heads and twenty arms, had, by dint of

austerities, obtained from Brahman the promise that neither gods nor demons should be able to take his life. In consequence, he oppressed the whole universe: the sun dared not shine hot, or the fire burn, or the wind blow, where he stood, and the ocean, when it saw him, became motionless. The gods, thus seeing the world and their own existence endangered, implored Brahman to protect them; and he, remembering that the demon, when asking for the boon he had granted him, omitted to include men among the beings that should not hurt him, advised the gods to pray to V. to become incarnate. This they did, and V. granted their prayer. At that time, *Das'aratha*, a king of Ayodhyâ, of the solar line of Hindu kings, performed the great horse-sacrifice in order to obtain sons; for though he had three wives, *Kaus'alyâ*, *Sumitrâ*, and *Kaikeyî*, he was without male progeny. This sacrifice became successful, for, when on the point of completion, a supernatural being appeared to him with a divine beverage, one-half of which he was to give to Kaus'alyâ, one-fourth to Sumitrâ, and the remaining fourth to Kaikeyî. And as this nectar which he gave them contained the divine essence of V., *Râma*, the son whom Kaus'alyâ brought forth, became one-half, the twins *Lakshman'a* and *S'atrughna*, born by Sumitrâ, together one-fourth, and *Bharata*, the son of Kaikeyî, another fourth, of the substance of Vishn'u. While Râma and his brothers were still boys, the sage *Vis'wâmitra* (q. v.) came to the court of Das'aratha, requesting him that he should allow Râma to proceed to his hermitage, in order to destroy there the Râkshasas, or fiends, who infested it, and disturbed his sacrificial rites. Though reluctantly, Das'aratha gave his consent to his departure; and Râma, accompanied by his brother Lakshman'a—who, throughout his brother's career, remained his faithful companion and ally—started on his first eventful journey; for it was marked by a number of wonderful exploits which he performed in killing the demons, and which already then revealed his divine mission. Having fulfilled the desire of Viswâmitra, he proceeded to Mithilâ, where King *Janaka* held a great assembly of kings, having promised to give in marriage his daughter *Sîtâ* (q. v.) to the prince who would be able to bend the bow with which S'iva (q. v.) once conquered the gods at the sacrifice of Daksha, and which now was in his trust. Yet so large and heavy was this bow, that not even the strongest of them could so much as move it. But when Râma arrived, and the bow was shewn him, he lifted it up and bent it, as it were in sport, and ultimately even broke it in the middle. Sîtâ became thus the wife of Râma; while Janaka gave *Urmilâ* to Lakshman'a, *Mân'd'avî* to Bharata, and *S'rutakîrtti* to S'atrughna. On his way home, Râma met *Paras'urâma* (see the sixth Avatâra), who, having heard of his namesake's bow-feat at the court of Janaka, challenged him to bend also the bow of V., which he had received from his father, Jamadagni, and if he could do so, to a single combat. Râma, displeased with the doubt of Paras'urâma in his strength, immediately seized the bow, bent it, and would have killed the son of Jamadagni, had he not respected his quality as a Brâhman: still, he destroyed the worlds which the latter had acquired by his penance, and thus excluded him from heaven. (This account given of the meeting of the two Râmas, in the Râmâyan'a, would seem to shew that at the time when this poem was composed, the *Paras'urâma* was not yet conceived as an incarnation of V., since he is represented in it as jealous of the defeat which S'iva's bow had suffered at the hands of the son of Das'aratha.) After this event, Bharata, and his brother S'atrughna, were sent by their father on a visit to Bharata's maternal uncle, *As'wapati*; and Das'aratha, who was old, and desired to retire from the world, made all preparations for installing his eldest son, Râma, as heir-apparent to the throne of Ayodhyâ. But in this design he was frustrated; for, through the intrigues of *Mantharâ*, the hunchbacked nurse of Bharata, and his queen Kaikeyî, he was, in a weak moment, prevailed upon to grant any wish which the latter would ask of him; and Kaikeyî, availing himself of Das'aratha's rashly-given promise, demanded of him the installation of her own son, Bharata, as heir-apparent, and the banishment to the forest of Râma for a period of fourteen years. A promise once uttered being irrevocable, and Râma having resolved not to cause a word given by his father to remain vain, neither the wishes of the people of Ayodhyâ nor those of Bharata and S'atrughna, who meanwhile had returned, and were enraged at what had occurred, could shake his determination to submit to his exile. Das'aratha died in consequence heart-broken, and Bharata assumed, till the return of Râma, the government of Ayodhyâ.

The long exile of Râma which now followed, and was shared in by his brother Lakshman'a, became, then, the source of the wonderful events which should hereafter lead to the destruction of the demon Râvan'a. They began with a series of conflicts which he had to sustain with the Râkshasas, who infested his forest abode, and which invariably, of course, ended in the destruction of these beings. One of these conflicts, however, was especially pregnant with the destiny he had come to fulfil. Râvan'a's sister, *S'ûrpan'akhâ* (lit., a female whose finger-nails were like winnowing baskets), was one of those demons who haunted the woods. She fell in love with Râma, but was repelled by him; and when, in a fit of jealousy, she attacked Sîtâ, Lakshman'a cut off her ears and nose. Enraged at this treatment, she repaired to her brother Râvan'a, and in order better to stimulate his revenge, she also excited in him a passion for Sîtâ. Râvan'a therefore started off for the forest Dan'd'aka, where Râma lived; and, aided by another demon, Maricha, who transformed himself into a golden-coloured deer, and thus enticed both brothers away from the hermitage, to chase after it, succeeded in carrying off Sîtâ to his capital. By means of some other supernatural events then happening, Râma discovered the fate of his wife; and the remainder of his exile is now filled up with his preparing for war with Râvan'a, conquering, and destroying him, and recovering Sîtâ, whose honour had remained untarnished during her long and severe trials when kept as a prisoner in the harem of Râvan'a. Some of the incidents of this struggle are of special interest, inasmuch as they are the basis of traditions still prevalent in India. They chiefly relate to the allies of Râma, who were no other than miraculous bears and monkeys, and by their magic powers mainly brought about the defeat of Râvan'a and his armies, while also helping him to communicate with Sîtâ during her captivity. All these bears and monkeys were of divine origin, produced at the behest of Brahman by the gods for the express purpose of becoming the allies of Râma. Thus, the bear-king, *Jâmbuvat*, issued from the mouth of Brahman himself; *Bâli* was a son of Indra; *Sugrîva*, of the Sun; *Târa*, of Vr'ihaspati; *Gandhamâdana*, of Kuvera; *Nala*, of Vis'wakarman; *Nîla*, of Fire; *Sushen'a*, of Varun'a; *S'arabha*, of Parjanya; and the most renowned of all, *Hanumat*, was a son of Wind. See the article HANUMÂN, where several of his feats are mentioned. They overbridged the sea, to carry their armies to Ceylon—whence the line of rocks in the channel is still

called *Râmasetu*, or Râma's Bridge—in the English maps, Adam's Bridge; they brought large rocks from the Himâlaya to support the bridge—whence the numerous rocks scattered all over India are supposed to have arisen as they dropped down on their transport to the sea; and they performed similar other feats, still commemorated in festivals performed in honour of Hanumat and his tribe. As is the case in other Avatâras of V., there is also in the Râma-Avatâra a personage who, though nearly related to the fiend doomed to destruction, acknowledges the divine nature of the incarnate god, and dissuades his friends from opposing him. In this Avatâra such a personage is *Vibhîshan'a*, the uncle of Râvan'a,

Agni. Sitâ. Hanumat. Râma.

Fig. 1.—Sitâ is seen undergoing the fire ordeal, to satisfy the world of her chaste escape from the power of Râvan'a, comforted by the presence of Agni, the God of Fire.—From Moor's *Hindu Pantheon.*

whose counsel, however, is disregarded. Similarly disposed is also *Kumbhakarn'a*, the brother of Râvan'a, who likewise understands that Râma is V.; but, as he yields to the orders of his brother, his fate is death. Vibhîshan'a, however, in reward of his proper conduct, is, after Râvan'a's death, placed on the throne of Ceylon. When, at the end of this fierce war, the time fixed for Râma's exile had expired, he returned to Ayodhyâ with Sitâ, whose purity had previously been tested by an ordeal of fire, and there received back from Bharata the sovereign power which, in the meantime, the latter had exercised in his stead; and at the end of a long and glorious reign, he became reunited with the splendour of Vishn'u. The story of this incarnation is briefly told in an episode of the Mahâbhârata (q. v.), and in several Purân'as; with the fullest detail, however, in the *Râmâyan'a* (q. v.). A copious abstract of the latter is given in the poem *Bhat't'ikâvya.* See SANSCRIT LITERATURE. The English reader may consult, for some further detail, an 'Analysis of the Râmâyan'a,' in Professor Monier Williams's *Indian Epic Poetry* (Lond. 1863).

8. The *Kr'ishn'a-Avatâra* and *Balarâma-Avatâra.*—The former of these two, which are generally treated as one, is the most interesting incarnation of V., both on account of the opportunity which it affords to trace, in Hindu antiquity, the gradual transformation of mortal heroes into representatives of a god; and on account of the numerous legends connected with it, as well as the influence which it exercised on the Vaishn'ava cult (see VAISHN'AVAS). In the Mahâbhârata (as Mr Muir has shewn in the fourth volume of his excellent work, *Original Sanscrit Texts*), Kr'ishn'a—which literally means, 'the black or dark one'—is sometimes represented as rendering homage to S'iva (q. v.), and therefore acknowledging his own inferiority to that deity, or as recommending the worship of Umâ (q. v.), the consort of S'iva, and as receiving boons from both these deities. In some passages, again, he bears merely the character of a hero endowed with extraordinary powers, and, in some, his divine nature is even disputed or denied by his adversaries, though they are ultimately punished for this unbelief. As the intimate ally of the Pân'du prince, Arjuna (see PÂN'DAVAS), he claims, especially in the philosophical episode, the Bhagavadgîtâ, the rank of the supreme deity; but there are other passages, again, in the Mahâbhârata, in which the same claim of S'iva is admitted, and an attempt is made at compromising their rival claims by declaring both deities one and the same. Sometimes, moreover, Kr'ishn'a is, in this epos, declared to represent merely a very small portion—'a portion of a portion,' as it is called—of the divine essence of Vishn'u. In the Mahâbhârata, therefore, which is silent also regarding many adventures in Kr'ishn'a's life, fully detailed in the Purân'as, the worship of V. in this incarnation was by no means so generally admitted or settled as it is in many Purân'as of the Vishn'uite sect; nor was there, at the epic period, that consistency in the conception of a Kr'ishn'a-Avatâra which is traceable in the later works.—The principal legends relating to Kr'ishn'a, as he appears in the Harivans'a and the Purân'as, are the following. A demon king, *Kansa* of Mathurâ, of the race of Yadu, and therefore of the lunar line of kings, who, in a former birth, had been the demon *Kâlanemi*, had deposed and imprisoned his father, *Ugrasena*, and oppressed with his iniquitous hosts, the Earth; and Earth having laid her complaints before an assembly of the gods on Mount Meru, Brahman prayed to V. to

relieve the world of its distress. When he had ended his prayer, V. plucked off two hairs, one white, and one black, and promised the gods that these two hairs should become impersonated as *Balarâma* and *Kr'ishn'a*, sons of Devakî, to fulfil their wishes. Now, Devakî, who, in a former life, had been Aditi (space personified), was a wife of Vasudeva, who was of the race of Yadu, and a relative of Kansa; but as Kansa had been warned by a voice in heaven that their eighth child would be an incarnation of V., he placed both husband and wife in confinement, after having obtained, though, from Vasudeva the promise that he would deliver to him every child Devakî would bring forth. Six children of hers were accordingly given up to Kansa, and destroyed; but when Balarâma, the seventh, was about to come into the world, V. appeared to *Yoganidrâ*, a form of Umâ (q. v.), and directed her to transfer Balarâma before the time of his birth to *Rohin'î*, another wife of Vasudeva, and spread the report that Devakî had miscarried; enjoining her also to become incarnate as a child of Yas'odâ, the wife of an old cowherd Nanda, at the same time that he would become incarnate, as Kr'ishn'a, in the eighth conception of Devakî; for at the time of their simultaneous birth, he added, Vasudeva, aided by him, would bring the infant Kr'ishn'a to the bed of Yas'odâ, and her to that of Devakî. In this manner, *Balarâma* and *Kr'ishn'a* were saved, though the infant Durgâ, as soon as born, was dashed by Kansa against a stone, and suffered a temporary death. Kansa having become aware that his design had been frustrated, now ordered the destruction of all young children wherever they might be found, but considering it useless to keep Devakî and Vasudeva any longer in prison, liberated them. Vasudeva, apprehensive of the safety of Balarâma, then took him to Nanda, to be brought up together with Kr'ishn'a; and thus began the earthly career of these two Avatâras of V., in which Balarâma always figures as the friend and ally of his more important brother, Kr'ishn'a. The first miraculous act of the latter consisted in causing the death of a female demon, *Putanâ*, who suckled, and meant to destroy, him. Then, as a little boy, he overturned a heavy wagon of the cowherds, and pulled down the trunks of two large trees—to the amazement of the cowherds, who did not yet suspect his divine nature, and becoming afraid to remain any longer in Vraja, the place where these events happened, repaired to Vr'indâvan'a. There Balarâma and Kr'ishn'a remained until they had attained seven years of age. At this time, Kr'ishn'a killed a serpent-monster Kâlîya, in the Yamunâ river, and then returned to Vraja. The next exploit of the brothers, more particularly however, of Balarâma, consisted in the destruction of two demons, *Dhenuka* and *Pralamba*, who infested the forests; but that which followed, especially established the fame of Kr'ishn'a, and is one still commemorated in their festivals by the worshippers of this god. When sporting in Vraja, he once found all the cowherds busily engaged in preparing for a sacrifice to be offered to Indra (q. v.). Seeing this, he dissuaded them from worshipping this god, and directed them to address their prayers and offerings to the mountain *Govardhana*. Indra, however, offended by these proceedings, sent a heavy storm, which inundated the country, and threatened to destroy the cattle. Thereupon, Kr'ishn'a plucked up the mountain Govardhana from its base, and held it up as a large umbrella over the cowpens, to shelter the herdsmen and their cattle from the storm. For seven days and nights they were thus protected by the elevation of the mountain; and Indra, at last convinced of the irresistible might of Kr'ishn'a, came to Govardhana, and worshipped him, obtaining on this occasion the promise that Kr'ishn'a would befriend the Pân'd'u prince, Arjuna, in his conflict with the Kurus (see MAHÂBHÂRATA). The episode in the life of Kr'ishn'a which now ensued, and is filled up with the pleasures and sports he enjoyed amongst the Gopîs, or cowherdesses, is that commemorated in the Râsa Yâtrâ, an annual festival celebrated in various parts of India in the month of Kârttika (October—November), and dwelt upon in many poetical works. Of these cowherdesses, later poets especially mention *Râdhâ*; and she is sometimes also represented as the divine or mystical love to which Kr'ishn'a returns at the end of his more worldly amours (see the article JAYADEVA). After some more miraculous deeds, Kr'ishn'a and Balarâma repaired to Mathurâ, where Kansa, in the hope of effecting their death, had invited them to assist at a solemn rite of the lustration of arms, and to engage in a trial of strength with his chief boxers, *Chân'ûra* and *Musht'ika*. *Akrûra*, sent by Kansa to convey to them his invitation, had already revealed to them the purpose for which he was despatched; but undaunted by his words, they accomplished their journey, during which they performed several other wonderful deeds, and, arrived at Mathurâ, accepted the challenge of Kansa. The contest ended not only in the death of the two boxers, but in that of Kansa also. Kr'ishn'a now released *Ugrasena*, Kansa's father, from the confinement in which he was kept, and restored him to the throne of Mathurâ. A number of other miraculous feats now followed in the career of Kr'ishn'a. The principal are his conquering *Jarâsandha*, the father-in-law of Kansa, who came to revenge the death of the latter, and *Kâlayavana*, a king of the Yavanas, who also overran Mathurâ with his armies; and his founding the city of Dwârakâ. At the end of these wars, he made a short stay at Vraja, then returned to Dwârakâ, and there married Revatî, by whom he had two sons. But he also carried off violently *Rukmin'î*, the daughter of a king of Vidarbha, who had been betrothed to *S'is'upâla* (q. v.), and had to wage a hot contest with the latter and his allies, before he conquered them. His next war was that with *Naraka*, a demon-king of Prâgjyotisha, who had robbed Aditi of her earrings, and ultimately was put to death by him. He then repaired to Indra's heaven, to restore to Aditi her earrings; but carrying off a wonderful tree from Indra's garden, got into a conflict with this god; ultimately, however, he was allowed by him to take the tree to Dwârakâ. There he married 16,100 maidens, whom he had rescued from Naraka. Other wars followed, in one of which Kr'ishn'a also fought with S'iva, when siding with his enemy Bân'a, who was a son of Bali. The most important, however, of all these contests is the great war between the Kurus and Pân'd'us, in which Kr'ishn'a was the ally of the latter. According to the *Vishn'u-Purân'a*, Kr'ishn'a's earthly career was brought to its close by an event which has nothing in it of the miraculous, and is more consistent with the end of a mortal hero than with that of an incarnate god. He was accidentally shot in the sole by a hunter, who thought that he was aiming at a deer. The hunter, it is true, is called *Jarâ*, which is a word in the feminine gender, and means 'old age,' or 'decay;' but even if a mere allegory, the story of his end 'from old age,' or an arrow, barely tallies with the character assigned him in the Purân'as, and is therefore sometimes also omitted in the accounts of this Avatâra.—For Balarâma, see also the legend in the article YAMUNÂ.

9. The *Buddha-Avatâra*, or V.'s epiphany as Buddha.—It is originally foreign to the cycle of the Avatâras of V., and therefore only briefly alluded to in some Purân'as. Where this is done

the intention must have been to effect a compromise between Brahmaism and Buddhism, by trying to represent the latter religion as not irreconcilably antagonistic to the former. See BUDDHISM.

10. The *Kalki-* or *Kalkin-Avatâra*.—It is yet to come, 'when the practices taught by the Vedas and the institutes of the law, shall have ceased, and the close of the Kali or present age shall be nigh.' V. will then be born 'in the family of *Vishn'uyas'as* (possessing the glory of Vishn'u), an eminent Brahman of Sambhala village, endowed with the eight superhuman faculties. He will then destroy all the barbarians and thieves, and all whose minds are devoted to iniquity.'—*Vishn'u-Purân'a.*

V.'s wife is *S'rî*, or *Lakshmî* (q. v.), and his paradise *Vaikunt'ha.* When represented, he is of a

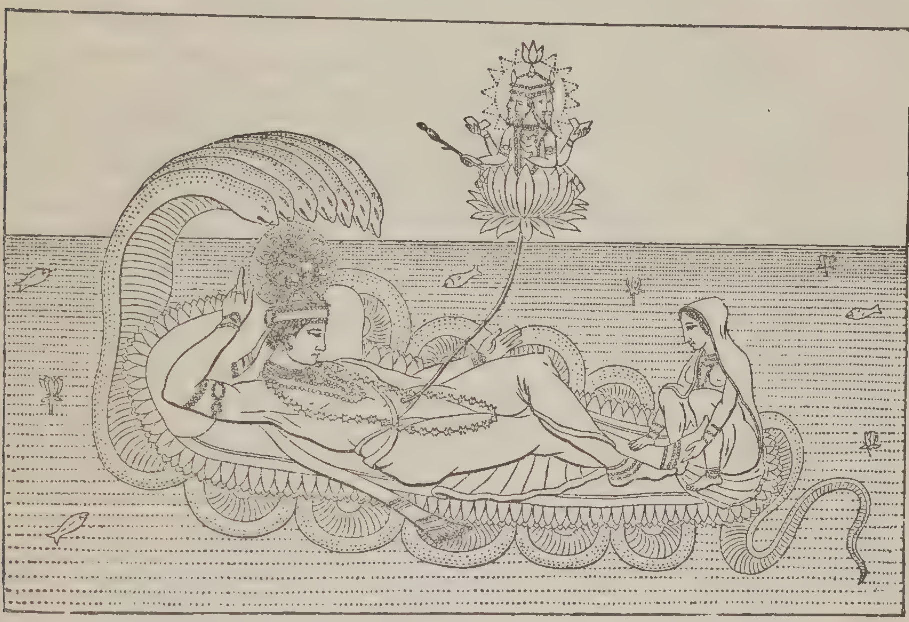


Fig. 2.—Vishn'u as Nârâyan'a.—From Moor's *Hindu Pantheon.*

dark hue, with four hands, in which he holds a conch-shell, blown in battle, the *Pânchajanya;* a disc, the *Sudars'ana,* an emblem of sovereign power; a mace, the *Kaumodakî,* as a symbol of punishment; and either a lotus, as a type of creative power, or a sword, the *Nandaka.* On his breast shines the jewel *Kaustubha.* He is variously represented: sometimes, as *Nârâyan'a** (see the first Avatâra), when floating on the primeval waters, and resting on *S'esha,* his serpent of infinity—the god Brahman coming out of a lotus that arises from his navel, and Lakshmî being seated at his feet; or riding on *Garud'a,* a being half bird and half man; or seated on a throne, and holding Lakshmî on his lap; or, if he is represented in one of his incarnate forms, as fish, boar, man-lion, &c., he has a human shape, ending in a fish, or a human body with a boar's head, or with a lion's head; or he appears as a dwarf, or (as Paras'urâma) armed with an axe; or (as Balarâma) holding a ploughshare. As Kr'ishn'a, he is generally represented either in a juvenile form, or as an adult, in a dancing posture, and playing on the flute. As Kalki, he has a sword in his hand, and is kneeling before a winged horse. The leading personages or events connected with these Avatâras are likewise frequently associated with the representation of the god: thus, in the representation of the fourth Avatâra, Hiran'yakas'ipu, as being torn open by the man-lion; or, in that of the sixth, the demon Arjuna, fighting with Paras'urâma; or, in that of the seventh, the ten-headed Râvan'a, battling with Râmachandra; or Hanumat and the monkey chiefs, paying adoration to the latter; while his brothers stand at his sides, and Sîtâ is sitting on his lap; or, in the eighth Avatâra, the mountain Govardhana, when uplifted by Kr'ishn'a, and the Gopîs sporting with him. V. is praised under thousand names, which are enumerated in the *Mahâbhârata,* and have been commented upon by S'ankara and other authors.—For other myths relating to V., the general reader may consult H. H. Wilson's translation of the *Vishn'u-Purân'a,* in the course of re-editing by Fitzedward Hall (vols. i., ii. already published Lond. 1864—1865); the first nine books of *le Bhâgavata-Purân'a,* traduit et publié par Eugène Burnouf, vols. i.—iii. (Paris, 1840—1847); *Harivans'a,* traduit par A. Langlois, vols. i., ii. (Paris, 1834—1835); Lassen's *Indische Alterthumskunde,* vol. i. (2d edition, Leipzig, 1866), vols. ii.—iv. (Bonn and Leipzig 1852—1861); and the first and fourth volumes of John Muir's *Original Sanscrit Texts* (Lond. 1858, 1863); see also the representations of V. in Edward Moor's *Hindu Pantheon* (Lond. 1810).

* 'The waters are called *nâra,* because they were the production of *nara* (or the supreme spirit); and since they were his first *ayana* (or place of rest, when in the form of the god Brahman), he thence is named *Nârâyan'a* (or resting on the waters).'—*Manu.* i. 10.

VISHN'U-PURÂN'A. See PURÂN'A.

VISIBLE SPEECH, a system of alphabetic

characters, each of which represents the configuration of the mouth which produces the sound of the letter. The system—the invention of Mr Melville Bell—is based on an exhaustive classification of the possible actions of the oral organs, each organ, and every mode of action, having its appropriate symbol. The radical symbols are combined into 'letters,' which thus yield a specific character for every variety of linguistic sound; even for those minutely differing shades which are not usually classed as separate elements, but considered only as accidental variations from the 'typical' or standard sounds of languages. In a comparison of languages, however, it will be found that no sounds are essentially typical, for the indefinite or accidental sounds of one tongue may be the standard sounds of another, and *vice versâ:* every distinguishable difference must therefore be included in a scheme of letters adapted for universal use.

In the experimental applications of visible speech, very striking results have been obtained, proving that words in any language, written in the new alphabet, suggest their exact utterance to readers who had never heard the words pronounced.

The types for the visible-speech alphabet not having been cast as yet, we are unable to shew the forms of the letters, and the mode in which they depict the oral configurations. Mr Bell has, however, given the most satisfactory proof of the reality of his discovery by submitting it to practical tests which leave no doubt of its completeness; and by exhibiting the symbols, and the theoretical details of their construction, to two or three competent witnesses. He has thus established the fact that, by means of not more than *thirty* radical symbols, every sound that can be formed by human organs may be physiologically written so as to insure a *fac-simile* pronunciation from all readers who are acquainted with the alphabet; and further, that the types formed from combinations of such radical symbols are as simple to the eye as common Roman letters.

The utility of this invention will obviously be very great, in enabling learners of foreign languages to master their pronunciation from books; in facilitating vernacular education in all countries; in the teaching of the deaf and dumb to speak; in international telegraphy; and in many other ways. Mr Bell points out that publication of his system under copyright would seriously interfere with its applications; and also that the scales of sounds should be orally exemplified to the first learners, so as to secure uniformity in the use of the symbols: and when it is considered that the latter are capable of representing some hundreds of elementary varieties, while the actually ascertained sounds of different languages exceed 100 in number, the importance of initiatory *vivâ voce* illustration will be apparent. The government has, therefore, been invited to undertake the typographic and oral inauguration of the system; and the inventor offers, in consideration of the public and international importance of the invention, to forego copyright in its publication under such circumstances. As yet, however, no member of the cabinet has been found willing to step beyond official routine for the investigation of the subject; and the proposal to make the use of the new alphabet as free as that of common letters has been addressed in vain to the various state-departments. Under these circumstances, the system will probably be published, eventually, as an ordinary copyright.

Meantime, we are enabled to present our readers with an outline of the scheme of symbols, although, for the reasons above stated, not with the symbols themselves:

ELEMENTARY SYMBOLS OF VISIBLE SPEECH.

1. Breath and Voice.
2. Emission, Suction, and Retention of Breath.
3. Guttural and Oral Contraction, in various degrees.
4. Guttural and Oral Closure.
5. Nasal Emission.
6. Parts of the Tongue, and of the Lips.
7. Parts of the Palate, &c.
8. Modes of Organic Action.
9. Consonant, Vowel, and Intermediate Modification.
10. Hiatus, Quantity, Accent, Tones, &c.

This list serves to shew the physiological character of the symbols, and the simplicity of the means adopted for the production of the demonstrated effects of visible speech. The correlation of the symbols is, however, the most important part; but this cannot be understood otherwise than from the symbols themselves, which are, by this means, self-explanatory of their sounds, as well as of the organic and mechanical relations which subsist between elements, or classes of sounds. Thus, the symbol for *p* indicates organic *closure* by the *lips;* and when this is learned, every letter which involves 'closure' by any part of the mouth is recognised at sight; the symbol for *b* denotes *closure* by the *lips*, accompanied by a murmur of *voice*, and when this is learned, every letter which is formed with 'voice' is discerned at once in any combination; and the symbol for *m* denotes *closure* by the *lips*, accompanied with *voice*, emitted through the *nose*, and when this is learned, every letter which involves a corresponding 'nasal' emission is identified without further explanation.

The total number of radical symbols is thirty; but not more than two-thirds of these are required in the writing of any European language. Perfectly illiterate persons in all countries will learn to read *their own language* from these symbols in a very few days, or hours; and when the symbols of known sounds are mastered, those for unknown sounds will, it is asserted, teach their own phonetic value, in most cases, with a close approximation to accuracy. Sir David Brewster, in his 'Report' on the invention, states that he has 'no doubt that it may be rendered intelligible by means of diagrams, aided by illustrations from the voice of a teacher;' consequently, that it may be taught to foreigners without the use of language as a medium of instruction.

The adoption of this system will not in any way interfere with existing alphabets. It is therefore free from the objections which have been made to 'phonetic' alterations of established 'spelling.' Visible speech will furnish a pronouncing key to the orthography of all languages, while it serves its own independent and totally new purposes as a dialectic and international alphabet, universally.

VI'SIGOTHS. See GOTHS.

VISION, the act of seeing; that faculty of the mind by means of which, through its appropriate material organ, the Eye (q. v.), we are percipient of the visible appearances of the external world. Considered in the latter signification, vision includes questions of high importance in relation to some of the most intricate problems of philosophy; but as this part of the subject has already been discussed under PERCEPTION, the present article will be restricted, as far as possible, to an exposition of the phenomena and laws of vision proper. In opposition to the bulk of mankind, who believe undoubtingly that they actually *see* the externality and

solidity of the bodies around them, Bishop Berkeley maintained that these properties are not the immediate objects of sight at all, but are simply ideas derived originally from the touch, and erroneously attributed to vision, in consequence of their having been uniformly experienced concurrently with certain 'visible signs' (as, for example, colour), with which alone the sense of sight is truly conversant; and this theory of vision having since received the adhesion of a great majority of the most able metaphysicians, it will be proper to give an outline of its leading propositions. In doing this, we shall at the same time intersperse such remarks and counter-statements as may appear to be rendered necessary by the progress of opinion and the results of modern experimental inquiry. As to the externality, or outness, of objects; or, which is the same thing, their distance from the eye. This, Berkeley maintains, cannot of itself and immediately be seen. 'For distance being a line directed end-wise to the eye, it projects only one point in the fund of the eye; which point remains invariably the same, whether the distance be longer or shorter.' To this position, everywhere assumed by Berkeley to be indisputable, and by his followers admitted to be so, it may be objected, that it contains an unwarranted assumption, viz., that a ray of light is, by its very nature, incompetent to convey an impression indicative of its possessing length or extension; or, to speak more accurately, it assumes that 'apparent distance' is not at all affected by a variation in the actual length of the ray intervening between the eye and the object. Yet it seems obvious, that the facts of vision do not admit of our arguing the matter, as though the line extending from any point of an object to the eye were a mere mathematical abstraction. Every visible point sends forth diverging rays, which form a cone whose base is on the pupil of the eye; and to the eye, the place of this visible point is at the intersection, real or virtual, of the rays in question: real, when the radiant point is viewed directly; virtual, when the rays, either by refraction or reflection, are diverted from their original path before reaching the eye. To take a case of refraction: if we notice the distance of a shilling lying at the bottom of an empty vessel, we shall observe, upon filling the latter with water, a manifest diminution in the apparent distance of the shilling, the reason being that the rays, on their emergence from the water, are bent outwards, so that the point of their virtual intersection is brought nearer to the eye. In reflection, the place of a visible point is, in like manner, referred to the point of virtual intersection of the cone of rays incident upon the pupil; and by multiplied reflections, the apparent distance of a point actually adjacent to the eye, may be increased to an almost indefinite degree. It is forcibly contended by Berkeley that these facts, involving, as they do, geometrical considerations known only to few, and by none consciously realised in the act of vision, cannot be concerned in our appreciation of distance by the visive faculty. Yet these, and numberless similar experiments, render it evident that both 'apparent distance' and 'apparent place' are closely dependent upon these geometrical conditions; and, therefore, without assuming that vision is performed by the aid of connate or instinctive geometry (a notion justly condemned by Berkeley), it yet seems highly probable that these lines and angles are the exponents and invariable concomitants of an actual operation of light upon the eye, specific in its character, and by reason of its necessarily varying, *pari passû*, with every change in the distance of the point of intersection of the visual rays, fitted to convey to us an intuitive perception of varying distance.

In the article EYE (q. v.), it has been shewn (as, indeed, necessarily follows from optical principles) that the eye does actually undergo specific modifications, depending for their amount on the distance of the object; and there therefore seems an intrinsic probability that these distantial variations in the organ of sight are correlated to those facts of our consciousness which we denominate variations of visible (not tangible) distance; and as, furthermore, it may be demonstrated by optical experiments that the 'apparent distance' of a visible point is directly modified, to our perception, by a simple change in the mutual inclination of its diverging rays, it seems an inevitable conclusion, that that agency of light which suggests to our minds differences of distance is competent to suggest distance itself.

Berkeley was quite aware of the necessary connection which subsists between the distance of an object and the divergency of the rays it emits, though it may be doubted whether he adequately weighed the importance of the train of consequences evoked within the eye itself by this variable divergency of incidence; but he affirms that the mind is not by these means helped to a conception of distance except in so far as by experience we have found that increased divergency, carried to the extent of producing 'confused vision,' is constantly associated with diminished distance. And in proof that this association is merely accidental, Berkeley cites a curious optical experiment, which shews that where the incident rays are caused slightly to converge, instead of their suggesting, as one would be led to expect, that the object is at an enormous distance, the result is altogether different; viz., at first, when the eye is close to the lens, and vision distinct, the object is seen at its true distance, but afterwards, as the eye is gradually withdrawn, and vision becomes continually more 'confused,' the object appears to be enlarged in all its dimensions, and to approach nearer and nearer, until it vanishes in mere confusion from the view. 'This phenomenon,' he says, 'entirely subverts the opinion of those who will have us judge of distance by lines and angles, on which supposition it is altogether inexplicable.' To which it may be replied, that the hypothesis being that the mind judges (mediately) by 'the various divergency of rays,' it cannot fairly be tested by experimenting with rays that are convergent, and that necessarily produce conditions of vision the reverse of those normally prevalent. But, besides, it is now certain that the explanation given by Berkeley is not the true one; for it has been shewn, by Professor Wheatstone, that when the dimensions of a retinal picture are continuously increased (as is the case in the above experiment), the object appears to approach in the most evident manner.

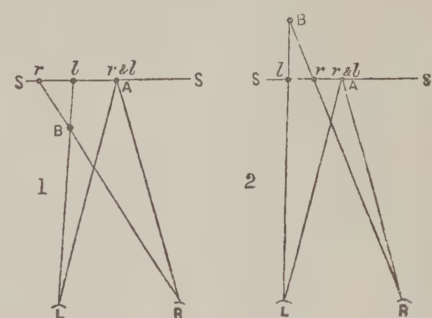
From the doctrine of Berkeley, that the sight is not immediately perceptive of distance, it necessarily follows that the parts of a solid object will not be seen as some of them more remote than others, but as if situated all in one and the same plane. This opinion has accordingly been maintained by more recent writers; yet its unsoundness seems manifest; for, if objects be originally seen, not as solid objects, but as perspective representations on a plane, then this plane must be seen either at no distance (which is absurd), or at the same distance for all objects (for which no reason and no evidence can be assigned); or at distances varying with the distances of the objects; but as the last two and only tenable suppositions assume the visual perception of distance, which is the very principle sought to be invalidated, the theory is thus shewn to be futile and self-contradictory. If it be admitted that, by the constitution of the organ

of sight in relation to light, we are perceptive of distance at all, it is in the highest degree probable, judging not only from analogy, but from the proved distantial affections of the eye, that we perceive by the sight degrees of distance; and a perception of the latter implies, it has been shewn, a perception of trinal dimensions. Now, although it is strenuously maintained by the adherents of Berkeley that this is not a primitive attribute of vision, it is not denied by any, that in the exercise of our mature sight, we do undoubtedly perceive the outness, the distance, and the trinal extension of visible objects; but, say they, these very qualities, not being modifications of light or colours, are only in appearance directly perceived by the eye; they are, in fact, the product of tactual experience, but by long and invariable association with the phenomena proper to sight, are now instantaneously suggested by them, in a manner so intimate that the two sets of perceptions have become, to our consciousness, indissolubly one. This, in effect, is to affirm that we cannot see an object to be possessed of trinal dimensions, until its occupancy of space is assured to us by the touch; whereas, we venture to maintain, that we see objects to occupy space, and that what we owe to experience is a knowledge that the major part of these visible appearances have, underlying them, that which, on our making a proper disposition of our bodies, will produce in us tactual sensations. We advisedly say the major part, because there are many objects in nature, such, for instance, as wreaths of smoke and vapour, which, though to the sight visibly possessed of trinal dimensions, are totally imperceptible to the touch. And this suggests the remark, that a great diversity of opinion has arisen out of the ambiguous meaning of the word 'solidity,' by which those who agree with Berkeley always signify, not mere occupancy of space, which, as we have shewn, may be associated with a total absence of tangible qualities, but 'resistant extension' in three dimensions, which, beyond all doubt, is solely cognisable by the touch. It is, of course, in the former sense alone that we vindicate to the sight an immediate perception of 'solidity;' and we do not use the term 'occupancy of space' at all in the sense of mechanical exclusion, an idea manifestly derived from touch, but only as affirming the immediately perceived trinal extension of visible objects. It may also be here remarked, that there are many substances of extreme hardness, and therefore in the highest degree perceptible to the touch, which, though set in a strong light, remain quite invisible; as, for example, the sheets of plate-glass used by Professor Pepper in producing his 'ghost-illusions.' Indeed, strictly speaking, all *perfectly* transparent substances, and all *perfectly* reflecting (polished) surfaces, are invisible. Again, there are many appearances in nature, into our perception of which there enters no element of tactual experience, even as it respects variety of surface (colour, of course, being excluded from this consideration); as, for example, the waves of the sea, spread out in long undulating lines, or breaking in foam upon the shore; and all those objects which, by their minuteness and the delicate diversifications of their shape and outline, elude the cognizance of the touch. These facts are adduced simply to illustrate the complete distinction and independence which subsists between the two sets of sensations, originating, respectively, with the sight and the touch—a point strongly enforced by Berkeley himself, who did not hesitate to affirm, not only that our habit of referring the two sets of sensations to the same objects is the mere effect of our having experienced them together, but that the two sets of ideas thus 'intromitted into the mind' belong, in fact, to two classes of objects, numerically distinct—the one outward, distant, and tangible; the other visible, but at no distance, and therefore, in reality, contained within the mind itself. But, as has been well pointed out by Mr Bailey, this very distinction, taken in conjunction with the undoubted fact, that we do in maturity apprehend by the sight the distance of visible objects, furnishes a strong presumption that those perceptions cannot have belonged originally to the touch. How little tactual sensations are able to modify visual perceptions is exemplified (as Mr Bailey remarks) by the fact, that 'a straight stick, with one end placed in a basin of water, would still appear to the sight to be bent at that end, after a thousand proofs by the touch that it was otherwise.' In the same way, the finger immersed in water appears 'unnaturally bent, though the experimenter feels it to be otherwise.'

The nature of 'visible' or 'apparent distance,' and how it compares with 'real distance,' we shall consider when we come to speak of apparent, as contrasted with real magnitude. But we will first inquire what are the optical conditions within the eye itself which determine our perception of the direction of a visible point. Every such point, as we have before remarked, radiates to the eye a cone of diverging rays, whose base is situated in the pupil of the eye; and these rays being refracted in their passage through the eye, are brought to a focus on the retina, thus forming another cone, the base of which is opposed to that of the incident cone, whilst its apex coincides with the focal point of the refracted rays. If the point of emission be placed directly before the eye, it will be seen in the direction of the common axis of these two cones; or, in other words, in the optic axis; and the point in which this axis bisects the common basis of the two cones is called the optical centre of the eye. Let us suppose, now, another visible point, a little above the first, but at an equal distance from the eye; this, too, will send forth to the eye diverging rays, which will, in like manner, be refracted to a focus upon the retina at a point a little below the preceding; and the line of visible direction will pass from the point of convergence on the retina through the optical centre. Now, it is evident that the rays, by means of which we see a visible point, come to the retina from all possible directions within the limits of the cones they collectively form. How comes it, then, that we perceive the object only in one determinate direction? The explanation usually given (founded on experiments in which a portion of the cone has been excluded without apparent change in the visible direction) is, that, by the constitution of the sense, upon any point in the retina receiving the apex of a cone of rays, we perceive the object in a right line extending from that point of the retina through the optical centre; or, according to others, in a right line perpendicular to the surface of the retina at that point. It will, however, be more consistent with the principle that the incidence of light is accompanied by a positive action, related to its direction as well as to its other properties, if we express the law of visible direction by saying, that upon a multitude of rays from all possible directions falling upon a retinal point, the perceived direction is the mean or resultant of them all; which is just as true an account of the phenomena, and amounts, we think, to something more than a verbal distinction. The optical facts we have thus, in brief, indicated, if followed out with respect to all the visible points forming the objects of sight, render it evident that inverted images of the latter are painted upon the retina; and the inquiry is prompted, how

these can give rise to erect vision. On reflection, it will be seen that an explanation of this old and much debated 'paradox of vision,' is involved in the preceding statement of the law of visible direction, in whichever way it may be expressed; and, as has been shewn by previous writers, the difficulty itself has arisen solely from the assumption, contrary to fact, that we see the retinal pictures, whereas, considered as images, they are not even the means, but only the concomitants of that operation of light by which we see. Even this important distinction, however, does not convey the whole truth; and we trust it will not be deemed an unnecessary refinement, if we point out that in a strict sense there is no *image* upon the retina, but only a concourse of rays, which, *to the eye of another person*, will undoubtedly give the perception of an image, but cannot be affirmed to exist, as an image, except in relation to this second observer. It is therefore with this reservation that the term retinal images is here made use of. As a consequence of all the lines of visible direction passing through the centre of the eye, it follows that as an object recedes from or approaches the eye, its retinal image becomes proportionally less, or greater; and, in like manner, the visible object itself varies in magnitude, under certain limitations, to be presently referred to, with every change in its distance. But as 'the magnitude of the object which exists without the mind, continues always invariably the same,' it is evident, argues Berkeley, that 'whenever we speak of the magnitude of anything, we must mean the tangible magnitude,' which alone is measurable by 'settled stated lengths.' The sense in which this is true, clearly illustrates the nature of magnitude and distance, as apprehended by the sight, in contradistinction to what is called real magnitude and real distance, the product of tactual experience. It must not be understood as imputing to the touch a superiority in mensurative capacity, but as simply meaning, that by the touch we come to know that the external world is endowed with resistant qualities—such as hardness, impenetrability, and incompressibility—qualities which we cannot conceive as modifiable by our bare visual perception of them; and from this experience accrues our conception of the reality and actuality of the magnitude and distance of objects, accompanied by a belief that the variability of magnitude and distance preceded by the sight is an appearance only, and dependent on conditions solely of a subjective kind. If this be a correct view, we are not forced to deny with Berkeley that the objects of sight are numerically the same as those we are cognizant of by the touch.

But we must now pass on to the concluding part of the subject—viz., 'single vision with two eyes;' in treating of which we shall have recourse, almost exclusively, to the masterly researches of Professor Wheatstone, of whose admirable discoveries in this department of knowledge we have already had occasion to speak in the article STEREOSCOPE (q. v.). It will be obvious to those who have read what is there stated, that the question of single vision with two eyes is naturally divisible into two classes—the first including those cases in which the optic axes are parallel, and the retinal images exactly alike; and the second, those in which the optic axes are convergent, and the retinal images dissimilar. Now, to see an object double is to see it in two different places at the same time; and therefore, if it can be shewn that by the law of visible direction an impression upon corresponding points of the two retinæ is necessarily referred to the same place, this will account for our single vision of the object at that spot. And, on consideration, it will be plain that this is really what happens when the optic axes are parallel, and the images identical. But it is also evident that this explanation does not apply to the second class of instances; in which the only visible point which depicts itself on corresponding portions of the two retinæ, is that point to which the optic axes are directed. All other points, whether situated before, beyond, or in the plane of the horopter,* are projected upon non-corresponding points of the retinæ; and as these conditions were presumed to be inconsistent with single vision, it was asserted by Aquilonius that objects are seen single only in the plane of the horopter (it has since, with greater consistency, been said, only at the point of intersection of the optic axes); but that this is not true is evinced by our common experience that, without movement of the optic axes, we enjoy a certain limited field of distinct vision. Its complete refutation, however, is involved in the theory of stereoscopic vision, which may be thus explained: Let the optic axis of the right eye (R) and of the left eye (L) be converged on the point A; suppose another point B, slightly to the left, and in advance of A; and then through the point B draw lines from L and R respectively intersecting the plane of the horopter in *r* and *l* (fig. 1). Now, if two diagrams, SS, be prepared (the one representing *l* and A, and the other *r* and A), and these be presented to their appropriate eyes in the stereoscope, with the view of each eye limited to its own picture; the points *r* and *l* will be seen as a *single*



point, situated not on the paper, but in advance of it, in the point of intersection of the lines of visible direction, indicated in the above construction by R*r* and L*l*. If the point B be supposed beyond A, and also to the left of it, the lines drawn from L and R to B will intersect the plane of the horopter in *l* and *r* (fig. 2); and stereoscopic pictures SS prepared under these converse conditions will exhibit the points *l* and *r* as a single point placed behind A at the point of intersection of the lines drawn from L and R respectively. This simple rule involves, as it seems to us, the true principle of the stereoscope; and it is capable of being applied to the most complicated stereoscopic pictures. For, in a stereogram, let *l* and *r* stand for identical parts of the left and right pictures respectively, and suppose the pictures superposed; those parts which, read off laterally from left to right, stand in the order *lr* will recede, and those in the order *rl* will protrude (relatively to those parts of the pictures in which *r* and *l* absolutely overlie each other), when the pictures are

* The horopter is a right line drawn through the point of intersection of the optic axes parallel with a line joining the centres of the eyes; a plane drawn through this right line at right angles to the plane of the optic axes, is called the plane of the horopter.

viewed together in the stereoscope. It appears, then, that vision of the third dimension of space is directly obtained by impressions on non-corresponding retinal points; the proof of this being given in the appearance of solidity experienced in the stereoscope, although perfectly plane representations are alone employed; but it would be an error to suppose that this non-correspondence is without a limit; and the question still remains, to what extent the retinal points affected may be non-correspondent, consistently with single binocular vision. Without attempting to propose any definite solution of this difficult question, it may, we think, be considered as highly probable that this limit is determined by the same law which regulates our distinct vision of objects by means of rays inexactly focussed on the retinæ; for, according to Mr Abbott, 'as long as the rays are contained within the area of one sensitive minimum, the sensation will be that corresponding to the vision of a point;' and 'a certain amount of dispersion does not interfere with distinct vision.' It seems certain that the double perception which is experienced of the farther of two objects, when the optic axes are fixed on the nearer, or *vice versâ*, can only arise when the object, thus doubled, is situated within the angle of the optic axes (whether before or beyond their intersection); for under these circumstances only, the sensitive points affected are not simply non-correspondent, but are utterly diverse, being in fact on different sides of the centres of the retina in the two eyes. That the law of projection of the various points composing the relief of a stereoscopic object is correctly stated above, is strongly corroborated by a curious experiment of Mr Wheatstone's, in which, solid objects are placed in the stereoscope, instead of pictures. As, for example, two skeleton cubes, so placed, that when the optic axes converge upon them, identical pictures are depicted on the retinæ; in which case, all appearance of relief vanishes, and a perfectly plane perspective representation of a single cube is alone visible; the reason being, that the lines of visible direction for each point intersect each other, neither before nor beyond, but *in* the plane of the horopter, where, accordingly, the object is seen as a perspective projection. The same rule holds when the right and left eye pictures are interchanged, for the pictures being supposed, as before, to overlie one another, the parts *lr* become now *rl*; that is, instead of having their point of intersection beyond the plane of the horopter, they have it before that plane; and this, *mutatis mutandis*, being true of all the parts of the pictures, the stereoscopic resultant is the converse of that which would be perceived but for this abnormal arrangement. In these phenomena, named by Mr Wheatstone the 'conversion of relief,' and copiously treated of by him in his various papers, the usual relations of distance also are reversed, the nearer parts being seen as farther, while the latter are perceived to be of larger dimensions than the former; and, the same principle being applied to the vision of solid objects by means of an instrument called the Pseudoscope (q. v. in SUPPLEMENT), also invented by Mr Wheatstone, they are seen as if turned inside out, and under divers other aspects of a most extraordinary character, some account of which will be found in the article just cited. But, as to many of them, it is proper to mention, that the facility of conversion is found to depend, not on the optical conditions, which, of course, remain invariable, but upon mental conditions, as, for instance, previous familiarity or otherwise with the converse forms suggested; in short, upon our previous *visual* experience.

We have not yet considered those cases in which the retinal pictures are identical, and the optic axes convergent. In these, the law is, that the object is seen in the plane of the horopter, as is conclusively proved by a beautiful experiment, suggested by Sir D. Brewster. If, while looking at a wall-paper, consisting of a small pattern, continually repeated at intervals not exceeding 2½ inches from centre to centre, we cause the eyes to converge to a point in front of the wall, the paper will appear to advance to that point, and will there be plainly visible, in spite of the contradiction of the touch, which, of course, cannot feel the wall where it is seen; while, on the other hand, the eye can perceive no wall in the place where the touch affirms it to exist. The converse of this experiment, although more difficult to perform, is equally curious and instructive. It has also been shewn by Mr Wheatstone, that if an increasing convergence of the eyes be unaccompanied by its usual concomitant, a corresponding enlargement of the retinal pictures, the object is seen as if continuously diminished in all its proportions, albeit the size of the retinal images remains unaltered. This experiment, which, with several others of almost equal interest and importance, may be performed by means of the stereoscope, figured on p. 115, vol. 9 of this work, also establishes that every degree of convergence of the optic axes is associated with the particular adaptation of the eye suited for distinct vision at that distance. This adaptation is, of course, directly dependent upon the divergency, less or greater, of the impinging rays, and this again stands in a necessary relation to the distance, real or virtual, of the point from which they diverge; a branch of the subject to which we have already given sufficient prominence. All observations and experiments concur in shewing that a part of the highest importance is played in vision, by the convergence of the optic axes, in particular, in so far as this is conjoined with a difference between the two retinal pictures; and, for this reason, it matters but little that we cannot, within our present limits, enter on a discussion of the evidence obtained from those persons, blind from birth, who have gained their sight by means of a surgical operation; for, in almost every case, only one eye at a time was operated upon, and the information then obtained from the patients, under circumstances of so much difficulty, is admitted on all hands to be of a very dubious and unsatisfactory character.

By mere modification of the light incident upon the eye, the same visible objects may be seen under infinite variations of figure, situation, and magnitude; while, at the same time, their real figure, real situation, and real magnitude, as apprehended by the touch, shall remain unaltered; but these phenomena, artificially induced, argue nothing against the general fact, that under normal circumstances we find, in the very place of the visible objects, those 'dynamical qualities' which form the sum-total of our tactual experiences. To Berkeley is due the credit of having first pointed out the original entire disconnection and subsequent intimate blending of the two sets of experience—visive and tactual; but, if the views here proposed be correct, he erred in supposing that our realisation of the geometrical proportions and relations of visible objects, is dependent on the suggestions of touch, and not upon the exercise of a primitive and inherent function of sight. To the popular view, the *objects of sight* have a positive and equal existence in absolute darkness, and are simply rendered visible by the light; whereas they are, in truth, the light itself variously modified. But, in conclusion, while fully admitting that light and its modifications, viz., colour in all its varieties,

form the sole objects of sight, we venture to maintain that we only know colour by our perception of it, as making up, by its superficial distribution, the visible form and shape of the objects of the outer world; and that this our perception of the shape, relative magnitude, and situation of visible objects is immediate, and strictly regulated by the laws of light in relation to the visual organ, irrespective of, and even in opposition to, tactual experience; but, at the same time, we hold that to the touch alone, we owe our belief, that these visible appearances are the signs of a materiality underlying them, in its nature unaltered and unalterable by our bare visual perception of them under aspects continually varying; and therefore, in all questions which relate to real size or real distance, we necessarily have recourse in thought to those qualities of matter which are apprehensible by the touch.

That an instinctive power of direct visual perception is possessed by the young of the lower species, is not denied by any; whether a like power has been bestowed upon man, we must now leave to the consideration of the philosophic reader.

See Berkeley's *Theory of Vision;* also his Vindication of that theory, a rare tract, republished, with valuable notes, by H. V. H. Cowell (1860); Wheatstone *On the Physiology of Vision*, Part I., in *Phil. Trans.* (1838); Part II., *idem* (1852); Review of Berkeley's *Theory of Vision*, by Samuel Bailey; review of the last-named work by J. S. Mill, in his Dissertations and Discussions; *Sight and Touch*, by T. K. Abbott; &c.

VISITA'TIONS, HERALDS', periodical circuits which were in use to be performed by the provincial kings-of-arms in England, in order to take cognizance of the arms, pedigrees, and marriages of the nobility and gentry. A visitation is said to have been held as early as the reign of Henry IV.; but the earliest visitation, in pursuance of a royal commission, was made by Thomas Benolti, Clarencieux, in 1528—1529, and comprehended the counties of Worcester, Berks, Oxford, Wilts, Gloucester, and Stafford. From that time, the visitations were repeated at periods varying from 25 to 30 years; never, however, extending to Wales, except on one occasion, in 1581. The latest commission was dated May 13, 1686, and under it some pedigrees were recorded as late as 1703—1704. The cessation of the visitations seems to have arisen from the frequent prohibitions granted by the Court of King's Bench to stay proceedings in the Earl Marshal's Court, and the abolition of the Constable as a permanent officer, in consequence of which the officers-of-arms found it difficult to enforce attendance. The records of the visitations, though not absolutely free from error, contain a mass of historical and genealogical information of great value. They form the principal source of evidence regarding the hereditary right to bear arms in England. The register-books have been scattered among various public and private libraries, including the British Museum (which possesses 312 visitation-books), the College-of-Arms in London, and the Bodleian Library. Some of them are no longer extant. A number of the visitations have lately been printed, and others are in the press. A catalogue of the visitations preserved in the British Museum was printed by Sir N. H. Nicolas in 1825; an index to the pedigrees and arms in about 250 of the principal MSS. there was published by Mr Sims in 1849; and an index to all the printed visitations by Mr George Marshall appeared in 1866.

In Scotland, there was no such regular system of visitations. A statute of James VI. (1592, c. 125) empowered Lyon King-of-Arms to visit the whole arms used within the realm; and visitations were undoubtedly made in pursuance of this act; but they seem to have been very partial, and no record of them is preserved. Something like a general visitation of Scotland again took place after the Restoration, under Act 1672, c. 21, the statute instituting the armorial register in the Lyon Office, which record was constituted the sole legal evidence of a right to bear arms, and has been continued to the present day.

VISITOR, in the Law of England, is one who has a right to inspect the internal government of a corporation or charity. Thus, the ordinary, who is generally the bishop, is the visitor of spiritual corporations. Corporations instituted for private charity and lay foundations are visitable by the founder, or his heirs, or his nominees.

VISOR, or **VIZOR**, otherwise called BEAUVOIR or BEAVER, the part of the helmet of the middle ages which protected the face. It was perforated to admit light, and movable, so that it could be raised or put down at pleasure. According to the rules established in the later heraldry, the helmet of a knight, when placed over his shield of arms, has the visor up, while that of an esquire has the visor down.

VI'STULA (Lat. *Vistula* or *Visula*, Ger. *Weichsel*, Russ. *Wisla*), an important river of Austria, Poland, and Prussia, rises in Austrian Silesia, near the frontier of Galicia, in a morass in the Jablunka Mountains, 15 miles south-east of Teschen (q. v.), and at the height of 2000 feet above sea-level. Formed by three head-waters, the White, the Little, and the Black Vistulas, the V. flows north-west a few miles to the village of Weichsel, where its course is marked by a fall of 180 feet, and thence to the town of Schwarzwasser, where it leaves the mountains. At this point, the V. turns north-east, and flows in this direction past Cracow, to its confluence with the San, 10 miles below Sandomierz, forming throughout nearly the whole of this part of its course the boundary between Galicia and Poland. From its confluence with the San, the river turns to the north, enters Poland, which it traverses in a general north-west direction, passing Lublin, Warsaw, and Lipno. Leaving Poland, it enters the kingdom of Prussia, flowing west-north-west to its junction with the Bomberger Canal; thence north-north-east, past Kulm and Schwetz, to Graudenz, where it turns north, and flows in that direction to its embouchure in the Baltic Sea, which it enters by several mouths. About 10 miles below Marienwerder, it throws off an arm called the Nogat, which, taking a north-east direction, and after flowing 32 miles, enters the Frische Haff by about 20 mouths. The main stream continues to flow north for 115 miles, dividing, however, into two branches, one of which flows into the Frische Haff, the other into the Gulf of Danzig at Weichselmunde, 3 miles below Danzig. The V. receives from the right the Bug, the San, the Dunajec, and the Wieprz; from the left, the Pilza and Brahe. The V. is 616 miles in entire length. It becomes navigable at Cracow for small vessels, and for large vessels at the confluence of the San.

VIS VIVA. See WORK.

VISWÂMITRA is one of the most interesting personages in the ancient history of India. According to the Aitarêya Brâhman'a (see VEDA), his father was *Gâthin;* and in a remoter degree, V. derived his pedigree from the king *Purûravas* (q. v.), who was an ancestor of Kus'ika. In the Mahâbhârata, Râmâyan'a, and the Purân'as, his father is called *Gâdhi*, and the origin of the latter likewise traced up to Purûravas; but the distance

between the two latter personages is differently filled up in the genealogies given by some of these works. As, according to several accounts, V.'s sister was *Satyavatî*, who married *Richîka*, and bore to him *Jamadagni*, he was the maternal grand-uncle of *Paras'urâma* (see VISHN'U, the sixth Avatâra). He had 100 sons, 50 of whom were, for an offence they committed, degraded by him to become outcasts, and the progenitors of the Andhras, Pun'd'ras, S'abaras, Pulindas, Mût'ibas, and other frontier tribes, which in the Vedas are called Dasyus, or robbers. V. is the author of many hymns of the R'igveda (see VEDA), especially of its third, Man'dala; but his fame, which pervades all the periods of Sanscrit literature, is chiefly founded on the remarkable fact, that though by birth a Kshattriya, or a man of the military caste—he is also described as a Ra'ja of Canouj—he succeeded in having himself admitted into the Brâhmanic caste, after a long contest, which, for this end, he had to wage with the R'ishi *Vasisht'ha* (q. v.). That the result of this contest was the elevation of V. to the rank of a Brâhman'a, is the account given in the epic poems and the Purân'as; but as the rivalry between V. and Vasisht'ha is already alluded to in several passages of the R'igveda hymns, and as at their time the caste distinction of later periods of Hinduism was not yet established, it is probable that the later traditions relating to this contest rested on the circumstance, that *Sudâs*, a king named in the R'igveda, who, as is there stated, employed Vasisht'ha for his house-priest, allowed, for some unknown reason, also V. to officiate for him at sacrifices, and that the latter, incurring on this ground the jealousy of Vasisht'ha, had to maintain, probably by force, the prerogative conferred on him by his royal master. In the epic poems and the Purân'as, the rivalry between these two personages is the subject of several legends, which, considering the relative age of the kings referred to in them, would encompass a period far exceeding that of the lifetime of a human being. A kind of consecutive biography of V. is given in the first book of the Râmâyan'a, of which it forms one of the most interesting episodes. Its substance is as follows: Once, when roaming over the earth with his armies, V. came to the hermitage of Vasisht'ha, and was there received by the saint in the most sumptuous style. Vasisht'ha could afford to entertain the king in this manner, because he possessed a fabulous cow of plenty that yielded him everything he desired. V., becoming aware of the source of Vasisht'ha's wealth, strongly wished to possess the cow, and asked Vasisht'ha to sell her to him. The saint, however, refusing this offer, the king seized her, intending to carry her off by force. But the cow resisted, and ultimately displayed her supernatural powers in producing from different parts of her body numerous peoples, and by their aid destroying the armies of Vis'wâmitra. The king then had recourse to the magical weapons he possessed, but they were defeated by those of Vasisht'ha; and to the humiliation thus inflicted on him he then gave vent in exclaiming: 'Contemptible is the might of a Kshattriya; a Brâhman's might alone is might.' And reflecting on what he should do in this emergency, he resolved to practise austerities in order to attain the rank of a Brâhman. In consequence, he went to the south, and performed severe penance during a thousand years; when, at the end of this period, the god Brahman appeared, and announced to him that he had become a Râjarshi, or royal R'ishi. But V., not satisfied with this degree of holiness, continued his austerities for another such period. During that time, a king, *Tris'anku* of Ayodhyâ (Oudh), of the family of *Ikshwâku*, had conceived the design of performing a sacrifice, that he might bodily ascend to heaven, and solicited for this purpose the assistance of Vasisht'ha, who was the family priest of 'all the Ikshwâkus.' This saint, however, having declared the scheme of the king impossible, and his sons, too, to whom the king likewise addressed himself, having refused compliance with his wishes, he told them that he would resort to another priest, and was, in consequence, cursed by them to become a man of the lowest caste. In this condition, he went to V.; and the latter shewed his power by performing the sacrifice, so much desired by Tris'anku, and accomplishing his object, in spite of the resistance of Vasisht'ha and his sons, and that of the gods themselves. (The *Harivans'a* relates this story with somewhat different detail, but brings it to the same issue. According to the Vishn'u-Purân'a, which alludes to the version mentioned in the last-named work, Tris'anku was the 28th in descent from Ikshwâku; but in the Râmâyan'a, there are only five kings between Ikshwâku and Tris'anku.) This event having caused a serious interruption in the austerities of V., he proceeded to the forest *Pushkara*, in the west, to remain undisturbed. But while he resided there, it so happened that *Ambarîsha*, another king of Ayodhyâ, intending to perform an expiatory sacrifice, and requiring a human victim for this purpose, after a long search, had bought for immolation from the Brâhman *Richîka*, the brother-in-law of V., his son *S'unahs'epha*, and was bringing him home to his capital. On his journey, he halted in the forest Pushkara, and when S'unahs'epha there saw his uncle V., he implored him to come to his rescue. V. first directed 50 of his sons to offer themselves up as a ransom for their cousin, and, on their refusing to do so, cursed them to become outcasts; but afterwards taught S'unahs'epha two hymns, which, as he said, if sung by him at the sacrifice, would save his life. (In the genealogy of the Râmâyan'a, there are 21 kings between Tris'anku and Ambarîsha; in that of the Vishn'u-Purân'a, 15 kings; and in the former, between Ikshwâku and Ambarîsha, 27; and in the latter, between Ikshwâku and Ambarîsha, the *successor of Tris'anku*, 43 kings.) The liberation of S'unahs'epha having been effected, and V. having continued his penance for another thousand years, the god Brahman conferred on him the dignity of a *R'ishi*. But not yet satisfied with this distinction, he went on practising still fiercer austerities than those he had practised before. These the gods succeeded in depriving for a time of their spiritual efficacy, by sending him a heavenly nymph, *Menakâ*, who excited his worldly passions; still, in the end, he attained the rank of a *Maharshi*, or great R'ishi. And, after two other thousand years of still more rigorous penance, which for a time was again interrupted by the allurements of a nymph, Rambhâ, whom the gods had sent for the same purpose as previously Menakâ, the gods, headed by Brahman, came to acknowledge that he had now become a Brahmarshi, or Brâhman'ic R'ishi; and Vasisht'ha himself was compelled to express acquiescence in the result he had achieved. For other legends relating to this contest between V. and Vasisht'ha, see vol. i. of John Muir's *Original Sanscrit Texts* (Lond. 1858); and the article HARIS'CHANDRA. Compare also VISHN'U, the 7th Avatâra.—The name of V. is explained in the Mârkan'd'eya-Purân'a as representing a compound, *vis'wa*, 'all,' and *amitra*, 'no-friend,' and meaning, 'one who is no-friend of all, *scil.*, the three worlds.' The Mahâbhârata, however, explains it as *vis'wa*, with its final vowel lengthened, and *mitra*, friend, when it would imply that V. was

'the friend of all, *scil.*, the gods;' and *Yâska*, the oldest writer who gives an etymology of this name, likewise renders it 'friend of all.' The former etymology would seem the more regular; but as in Vedic *inseparable* compounds the final vowel of the first part is frequently lengthened, the latter etymology is the preferable of the two.

VITA'CEÆ, also called SARMENTACEÆ and AMPELIDEÆ, a natural order of exogenous plants, of which the common vine may be regarded as the type. About 260 species are known, natives of warm and temperate climates, all shrubs, mostly climbing; with simple or compound leaves, with or without stipules, the lower leaves opposite, the upper ones alternate; the flower-stalks racemose, opposite to the leaves, sometimes (as in the vine), by abortion, changing into tendrils.—The only plant of the order of much value, in an economical point of view, is the Vine (q. v.), nor are there any fine fruits except its fruit (the grape); and that of species so closely allied to it as to be not improbably mere varieties; but species of the genus *Cissus* and of *Ampelopsis* (which many unite with *Cissus*) are sometimes planted for ornament. *Cissus antarctica* is the KANGAROO VINE of New Holland; and *Ampelopsis quinquefolia*, often called the VIRGINIAN CREEPER, is a frequent ornament of the fronts of houses in Britain and America, attaching itself to the wall by tendrils terminating in a peculiar kind of sucker, and climbing to a great height.

END OF VOL. IX